# MARINE REVIEW.

VOL. X. NO. 20.—**DOUBLE** CLEVELAND, O., NOV. 15 AND 22, 1894. **NUMBER**—VOL. X. NO. 21.

## The Piston Turned A Somersault.

The following correct account of the recent accident to the Peerless is quite interesting, and the owners are to be congratulated that the results are not more serious:

On Tuesday Nov. 6th, at 11:30 in the morning when about ten miles off St. Joseph, Mich., the piston rod suddenly broke in the cross head in the keyway, causing the engine to go through herself, breaking the cylinder, cylinder head and piston. The engine was on the up stroke, which resulted in the breaking of the cabin floor and also partly demolishing the roof of the cabin. The piston, which is 54 inches in diameter, was forced up to the ceiling, turning a complete somersault and landing on the cylinder, thereby partly demolishing the same. Mr. Bennett, chief engineer of the Peerless, was on duty at the time and immediately shut off the steam, thus preventing further damage to the machinery. The engine immediately preceeding the accident worked splendidly and no flaw in any shape or manner could be detected in the piston rod. No warning or indication was given until the break occurred, and the accident was unaccountable. No one was hurt, except the treasury of the company to an approximate amount of $1,000 and the loss of one round trip to Duluth and return. Immediately after the accident the first mate lowered one of the boats and rowed ashore, but before he reached the shore the signals were seen by Mr. J. H. Graham, president of the Graham & Morton Transportation Co., who immediately dispatched the tugs Tramp and Sanford to her assistance, taking her in tow about 3 o'clock arriving at St. Joseph, about 6 o'clock. The cargo was not at all damaged, and after unloading the same the tug Perfection, of the Dunham Towing and Wrecking Co., Chicago, towed the boat to Chicago, arriving there on Thursday morning.

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Notice is hereby given that the structure from which is shown the rear light of Winter point range, on the southerly end of Neebish island, St. Mary's river, has been moved to a point on the westerly prolongation of the range line, 675 feet in the rear of the front light, and the light exhibited therefrom as heretofore.

## Engines of the Torpedo Boat Destroyers.

From Engineering, London, are produced two views and some detail drawings of the engines of the Daring, duplicate of the Decoy, Ardent, Boxer and Bruiser, all built by J. I. Thornycroft & Co., Chiswick.

The engines illustrated are of the three-stage compound type, and have high and intermadiate preassure cylinders 19 in. and 27 in. in diameter, while there are two low-preassure cylinders, each 27 in. in diameter. The stroke is 16 in. The general design, as will be seen by the illustrations, is quite novel. The set of engines (there are two sets to each vessel) is structurally divided into two parts, of which the high and intermidiate cylinders form one, while the two low-preassure cylinders form the other. The cylinders are inclined from the vertical, and this enables the engines to be contained in a shorter fore-and-aft space than if they were upright. The crankpin bearings are of the great length usual in fast-running engines of this type, and, the cylinders overlapping in the way they do, there is no room for main bearings between the cylinders of each pair. Each pair of cranks is therefore arranged in the following manner: There are two ordinary crank webs forged in one with the shaft in the usual manner, and from these the crankpins project. At the other end of the crankpin is a double web common to both crankpins, one pin projecting from one end of the web and the other pin from the the other end. For purposes of description it might be said that are two overhung cranks connected by an intermediate web.

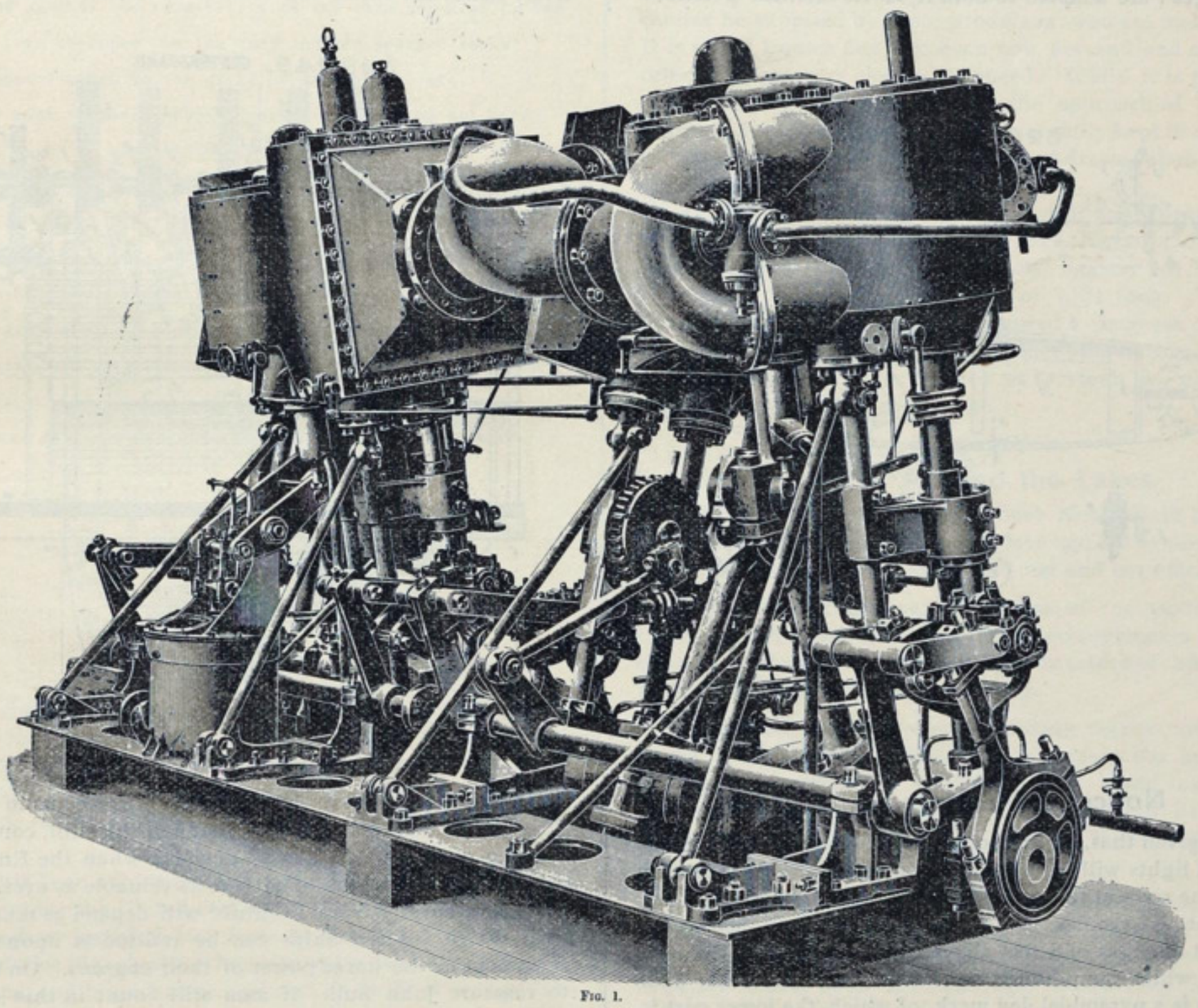


FIG. 1.

ENGINES OF THE DARING.

The framing of the engines is no less unusual than the crank arrangement. In place of the ordinary pillar standards placed back and front of the cylinders, there are central pillars in pairs, which extend down to the main bearings, being formed, in fact, by a prolongation upwards of the keep bolts of these bearings. In this way the standards are almost directly over the crankshaft, and practicallly in the same fore-and-aft plane as the piston-rods. They, therefore, take the thrust of the pistons directly, and it will be evident that the baseplates can thus be very much lightened. There are also diagonal stays, as shown in Fig. 3. Between each pair of

[CONTINUED ON PAGE 8.]

## Illustrated Patent Record.

SELECTED ABSTRACTS OF SPECIFICATIONS OF A MARINE NATURE—FROM LATEST PATENT OFFICE REPORTS.

**528,702. Row Boat.** Gustav Vogel. Orange Valley, N. J. Filed Apr. 4, 1894. Serial No. 506,261.

Claim. First, in a row boat, the combination of oars pivotally connected at their inner ends to a bracket or support adapted to rotate or turn horizontally, whereby said oars may be worked horizontally to propel the boat or be raised to a vertical position to serve as masts upon which to fasten a sail, and means for bracing and holding them in said vertical position. Second, in a row boat, the combinations of supports *c'*, secured to the inside of the boat, curved rests *f*, also secured to the sides of the boat, oars pivotally connected with said supports *c'* and working horizontally upon said rests, and blades or paddles C, pivotally connected with said oars at their outer extremities, and adapted to assume a vertical and an approximately horizontal position as they are moved to and fro in the water.

**528,749. Centerboard.** Henry Voss, Jersey City, N. J. Filed July 18 1894. Serial No. 517,848.

Claim. The combination of a well with a centerboard, shafts extending along both sides of the same, two sets of movable pinions *g*, *f*, mounted thereon, racks engaged by the pinions, wedges *h*, *i*, secured to the racks, and of which the wedges *h* are adapted to hold the centerboard in its vertical, and the wedges *i* are adapted to hold it in its inclined position.

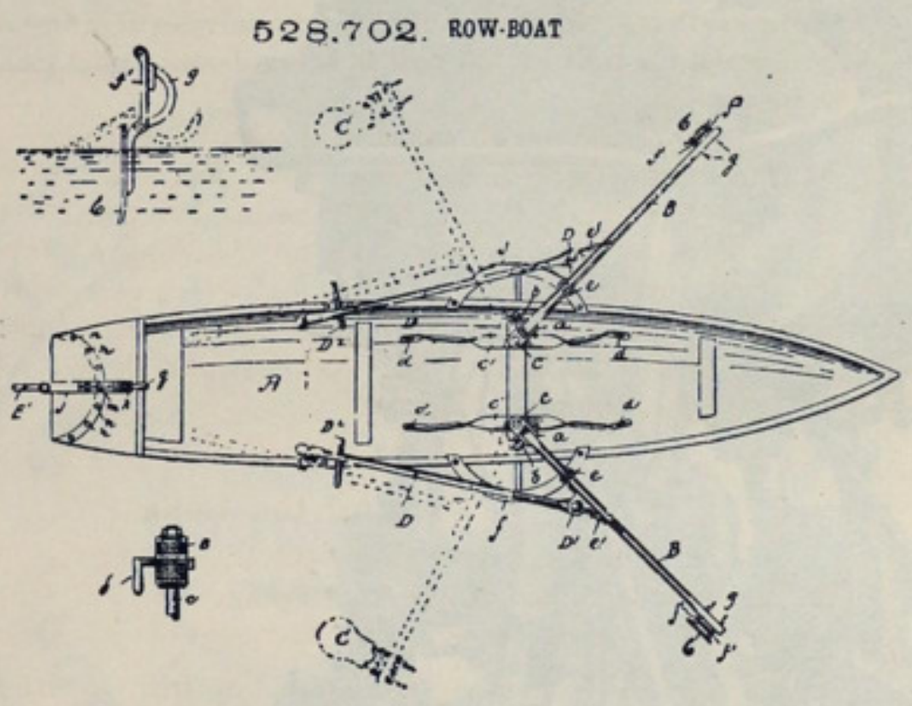
## Rewarded the Crew.

Last May, while on an Eastern trip, the German steamship Fuerst Bismark ran into the French bark Louise. The captain and crew of the bark demanded to be taken on board the steamer. Their demand was complied with. The officers of the steamer then examined the damaged bark and declared her seaworthy, but her crew declined to go aboard and man her, thus abondoning her. The captain of the Fuerst Bismark then put a volunteer crew of two officers and eight men on board the Louise. The crew after a two weeks' battle against head winds and a nasty sea, brought her safely into Falmouth harbor. The steamship company's claim for salvage has just been settled by arbitration, and 20,000 marks salvage was awarded. The company has decided to present the whole amount to the officers and men who saved the bark.

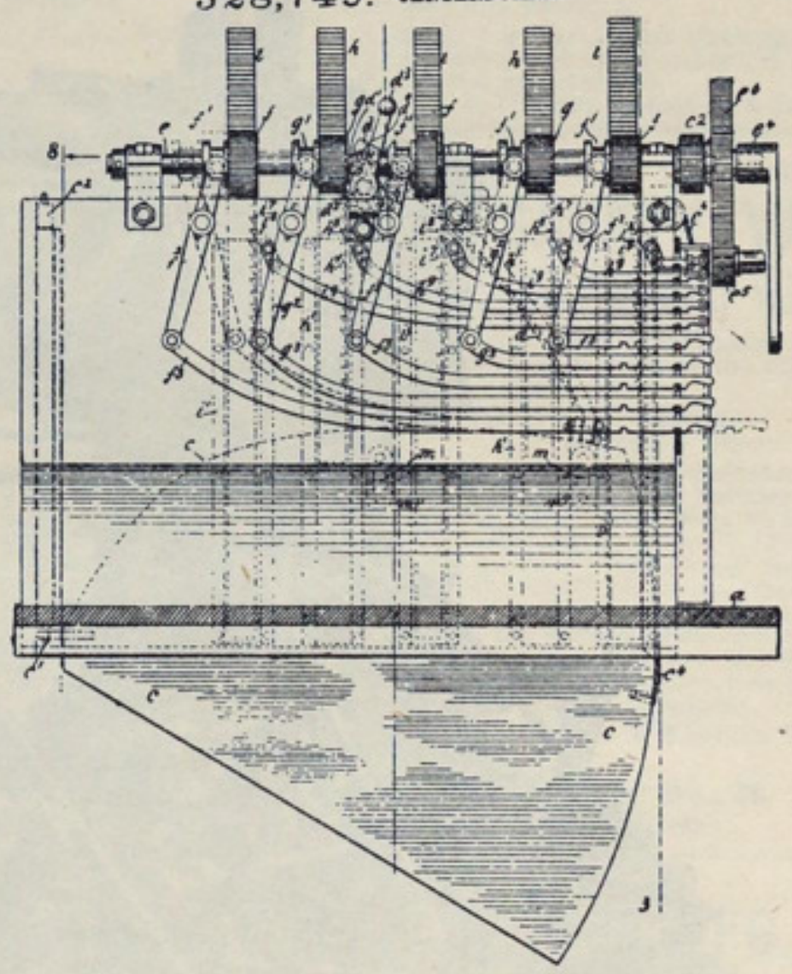
## Lessons on the Sea Fight.

It will be some time before the full significance of the fight at Yalu is understood. But already some things are clear. First and foremost is the old lesson that superior speed, which enables you to choose your own range to fight or refuse to fight at your discretion, is the most valuable factor in naval combats. Secondly, although both fleets were equipped with torpedoes, they were of no practical use in the action. The Japanese, when the fight was over, blew up a stranded ship with a torpedo, but that hardly counts. Thirdly, the big guns seem to have counted for comparatively little; the battle was decided by shells at long range and the hail of

528,702. ROW-BOAT



528,749. CENTERBOARD.



## Notice to Mariners.

Notice is hereby given that, on or about November 15, 1894, two fixed white tubular-lantern lights will be established to form an open range for entering or leaving the river at the entrance from Portage lake into the head of Portage river, Keweenaw peninsula. The front, or northerly, light will be shown at a height of 8 feet above the mean level of the lake from a small, square, white lamp-house, on a crib. In connection with the lamp-house there is a pyramidal day mark, of which the lower part is open and the upper part sheathed, rising 23 feet above lake level. The rear, or southerly, light will be shown at a height of 8 feet above the mean level of the lake from a small, square, white lamp-house on a crib, located about 1,650 feet S. 18° E. (S. by E. ⅝ E.) from the preceding. Bearing is true.

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Commodore Hichborn, the chief constructor of the United States navy, has worked out an interesting comparison of the relative cost per ton of iron and steel war ships of American and European build. According to his computations the Chicago cost $197 per ton, and the British Leander, of about the same size and a little more speed, $184; the Charleston cost $251, and the German Prince Wilhelm, of about the same size and speed, $261; the Philadelphia cost $306, and the French Cecille, larger, but of the same speed, $259; the Yorktown cost $262, and the English Surprise, very much the same sort of vessel, $210; the Baltimore cost $284, and the French Alger cost, in a dockyard, $278. According to Mr. Cramp, the well-known American ship builder, the price of material for government ships in the United States is about 10 per cent. higher than that for vessels of the merchant navy, on account of the severity of the government test.

the quick-firing guns. Fourthly, the ram seems to have counted for as little as the torpedo. Fifthly, seamanship, skill, courage and all the old fighting qualities which were decisive when the Empire of the Sea was won by Nelson's hearts of oak are as valuable as ever. Sixthly, and lastly, success in naval warfare in future will depend as much upon the rapidity with which injured ships can be refitted as upon the weight of their armament or the horse power of their engines. On the whole, this tends to reassure John Bull. If men still count in this era of machines, he thinks he will have the best of it, and when it comes to refitting he has got three docks and coaling stations for the enemy's one. The practical moral that England is taking to heart is that the power that commands the sea commands everything. The successes of the Japanese afford new and striking illustrations of what Captain Mahan calls the decisive influence of the sea power in history. The power that rules the sea rules the world. Hence, most Englishmen, however much they may have groaned under the increased income tax, must feel somewhat more comfortable in reflecting that the increased expenditure means increased security, and that Lord Rosebery's naval programme, though costly, will nevertheless insure their country that command of the seas which is the fundamental condition of its imperial existance.—"*The Progress of the World*," *November Review of Reviews.*

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Winston Bros. & Dear, contractors who have been engaged in stripping surface earth from iron deposits on the Mesabi, have begun work on a stripping contract with the owners of the Mahoning mine, that is said to involve the removal of 300,000 yards of surface.

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PHOTOGRAPHS of sixteen lake steamers and two color plates will be mailed to any address for 50 cents. MARINE REVIEW, Cleveland, O,

## Capt. Henry's Comments on the Steamer Globe.

L.V.

Lehigh Valley Transportation Company
Office of Manager
Buffalo N.Y. Nov 2nd, 1894

Mr John F Pankhurst, General Manager,
Globe Iron Works Company, Cleveland

Dear Sir,-

I went aboard the S.S."Globe" this forenoon, went all through her She is a very great freight ship Her strength is enormous; her freight handling facilities are excellent I talked with the Superintendent of the Line, and he said he never handled freight more rapidly than on the present occasion. I am very much surprised at the massiveness of her entire structure The frames are heavier than any thing I ever saw The plating is wonderfully heavy. The shear strake is a guarantee against the possibility of the ship breaking in two I noticed the angle iron stringer running fore and aft between decks; also the superior support given to the decks by stanchions, etc.

She is the most wonderful boat I have ever seen for all kind of business. She ought to have another fender strake for 75 or 100 feet around her bow. I am not very fond of having the engines and boilers so far in the stern; nor having the pilot houses on the stem. Of course, you have made some thing of a compromise on these, but I suppose this is the kind of ship the people all want. And is attracting a great deal of attention, here, because of her beauty, and her strength is the subject of universal conversation. I could not get into the water-bottom, but the Superintendent has promised to make an excursion there at the first opportunity, and give me a chance to look into it.

Yours truly,
Manager.

## Trade Notes.

Contracts were signed on Friday last between the Frontier Iron Works and James Davidson, the West Bay City ship builder, for two triple expansion engines, 20, 32 and 54 inches by 42 inches stroke. The boilers are to be duplicates of those in the Shenandoah. That this steamer proved so successful no doubt led to the placing of the order with the Frontier works.

The Blake pump has been adopted by the Newport News Ship Building and Dry Dock Company for the United States gunboats numbers 7, 8, and 9, the contract having been awarded last week to the Geo. F. Blake Mfg. Co. The contract includes Blake's special design of vertical duplex boiler feed pumps, fire pumps, and bilge pumps, and also an outfit of pumps for the distillers and evaporators.

One great trouble with fire extinguishers furnished lake vessels is that moisture attacks the seams from the outside if the chemicals do not eat through. Therefore a seamless extinguisher would be especially adapted for lake vessels. Information concerning such apparatus can be had by addressing Randolph & Clowes, Waterbury, Conn., the concern that manufactures seamless drawn copper tubes for lake steamers. It is known as the Guardian extinguisher.

The Montague Iron Works Co., Montague, Mich., has closed a contract with Captain W. H. Singer, manager of the Lake Superior Towing Association, Duluth, Minn., for a fore and aft compound marine engine, with cylinders 18 and 36 inches by 30-inch stroke and one marine boiler 9 feet in diameter by 14 feet long, to be placed in a large tug being built this winter at Ed. W. Heaths shipyard, Benton Harbor, Mich. The tug will be named Zenith, and will be one of the largest and most powerful tugs on the chain of lakes.

IF YOU SEND $1. TO THE MARINE REVIEW, 516 PERRY-PAYNE BUILDING, CLEVELAND, O., FOR FOUR STEEL ENGRAVINGS OF U. S. WAR SHIPS, ON HEAVY CARD, AND ARE NOT SATISFIED WITH THEM, WE WILL REFUND THE MONEY.

## Lake Ore is Fast Going Into Pig Iron.

In one department of its news columns the Iron Age of New York may be relied upon for trustworthy and conservative information. We refer to the regular weekly summary of the iron trade, made up in the office of the New York journal from reports of its correspondents, and especially such comment as is based on monthly statistics of the make of pig iron throughout the country. In commenting on returns from pig iron manufactures under date of Nov. 1, the Iron Age has this to say of the furnace districts that are almost entirely dependant upon the Lake Superior iron mining regions for ore:

"One feature in the situation in the iron trade proper deserves more consideration than has yet been given to it. It is a remarkable fact that in the area of production of cheap pig iron from lake ores and Connellsville coke the capacity is practically fully employed. In the whole districts embracing Buffalo, the Shenango valley, the Conemaugh, Pittsburg, the Mahoning valley, Cleveland, Wheeling and the Ohio river there are very few modern furnaces out of blast. On October 1, these districts were making with seventy furnaces close to 86,000 tons of iron per week. On Nov. 1 they were turning out close to 89,000 tons per week. All of the furnaces out of blast in that whole great region could not, at present prices, add 5,000 tons a week more than that total. The only reserve of really modern plant located to assemble materials to advantage and produce at low cost is to be found in the Chicago district. This means that if there is any quickening in the demand, notably for Bessemer pig, it cannot be supplied by those producers who are making iron at low cost. It is a well known fact that even now demand and supply in the markets referred to are very closely balanced. While it is possible that the concumption may soon fall off, with the approach of the usual midwinter dullness, it is a fact that should be carefully kept in mind that what might be termed the area of low cost is being drawn upon close up to its maximum capacity."

On Nov. 1 the weekly capacity of anthracite furnaces in blast throughout the country was 18,600 tons; coke furnaces, 135,572 tons; charcoal furnaces, 4,694 tons; total 158,866 tons, against 151,135 tons on Oct. 1, or an increase in capacity per week of 7,731 tons. Notwithstanding the heavy production, stocks again showed a decrease on Nov. 1, when they amounted to only 512,320 tons, against 524,712 tons on Oct. 1 and 532,964 tons on Sept. 1. These figures as to stock do not take into account amounts held by steel companies.

## Around the Lakes.

The new St. Clair river ferry boat Siesta, built by Langell & Sons of St. Clair was launched only a few days ago but is already in service. She measures 212 tons gross, and 129.71 net and her official number is 116,656.

Capt. J. W. Gilman, superintendent of the Goodrich Transportation Company, writes us that no definite arrangements have been made for the new passenger boat which the directors of his company proposed building at their last annual meeting.

Milwaukee vessel owners are getting restive under unfair tax assessments. The Milwaukee Steamship Company has announced that it will dissolve and organize in some other city, where the rate of taxation on vessel property is not so high, and Manager F. B. Ricketson of the Inter-Ocean Transportation Company says this is the last season for his company at Milwaukee.

Secretary Keep of the Lake Carrier's Association is informed that the light-house board will recommend to congress that an appropriation of $50,000 be made at the next session for gas buoys at Lansing shoal, north of Squaw island, Lake Michigan, and at Gravelley island shoal, Poverty passage. These aids to navigation are in the list of light and fog signals for which the vessel owners will try to secure appropriations in the next congress.

Judge Swan of the United States district court, Detroit, a few days ago decided that a pile driver is not a vessel for commerce or navigation. The decision was handed down in the case of some merchants against a pile driver owned in Alpena, to recover the value of some supplies advanced to the caretaker. The owners of the pile driver alleged that it was tied up to the shore, and that the supplies had been purchased by the caretaker who lived aboard of the boat during the winter time on his own credit.

The Prince of Whales has ordered a Clyde-built yacht of less beam than the Britannia to be ready for next season. Lord Dunraven will defer the definite approval of the designs submitted for his new challenge for the America's cup until the conditions governing the contest for the trophy shall have been definitely settled.

"ROPER'S LAND AND MARINE ENGINES," BOUND IN MOROCCO WITH FLAP AND POCKET, WILL BE MAILED TO ANY ADDRESS FOR $3.50 SENT TO THE MARINE REVIEW, CLEVELAND, O.

[CONTINUED FROM PAGE 5.]

these central standards, and attached to them, is a strong steel casting, plainly shown in Fig. 2. The bottom ends of the slipper guides are bolted to this casting. When it is necessary to examine or remove the main bearings, the nuts on the combined bolt and standard can be moved up on the latter, and the keeps can then be slid up, thus exposing the brasses.

In these engines a successful attempt has been made to arrange the moving parts so that they may counterbalance each other, no weights being necessary especially for balancing purposes; naturally a point of advantage in regard to the saving of weight. During the trial of the Daring, when running at full speed, vibration of the boat was hardly felt, as stated in the account of the trial. When the boat was steaming 29¼ knots one of the admirality officials wrote his name on a piece of paper which was resting on the deck at the stern, and though the writing shows slight evidence of tremor, it is perfectly distinct.

The boilers of the Daring are of the new Thornycroft water tube type, three in number and having a total heating surface of nearly 8,000 square feet; grate surface 189 feet. The propellers are three-bladed and of phosphor bronze. On the peliminary trial when the speed of 29.268 knots was reached the boiler preassure was 215 pounds and the revolutions 395; total indicated horse power 4,842. Figure 4 ahows the details of the cross bearers of the engine, there being practically no bed plate to these engines. The bearers are connected together longitudinally in the front by a stout steel angle bar, shown in figure 2, and in section in figure 3. When complete the cylinder will be covered with sheet steel. Figure 5 illustrates a device for facilitating the removing of main bearing peeps, which will be introduced in the other engines. Figure 6 illustrates the method

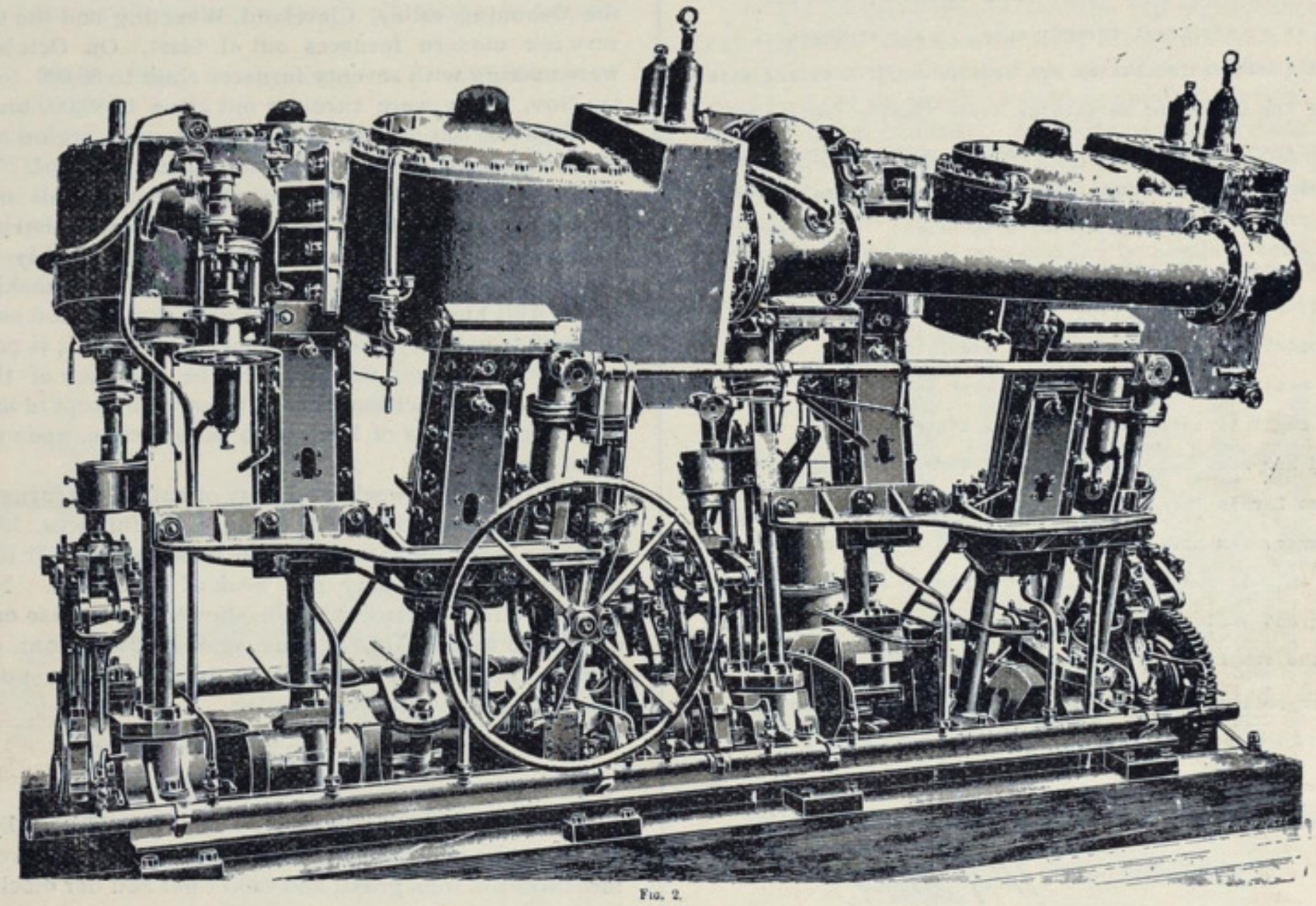
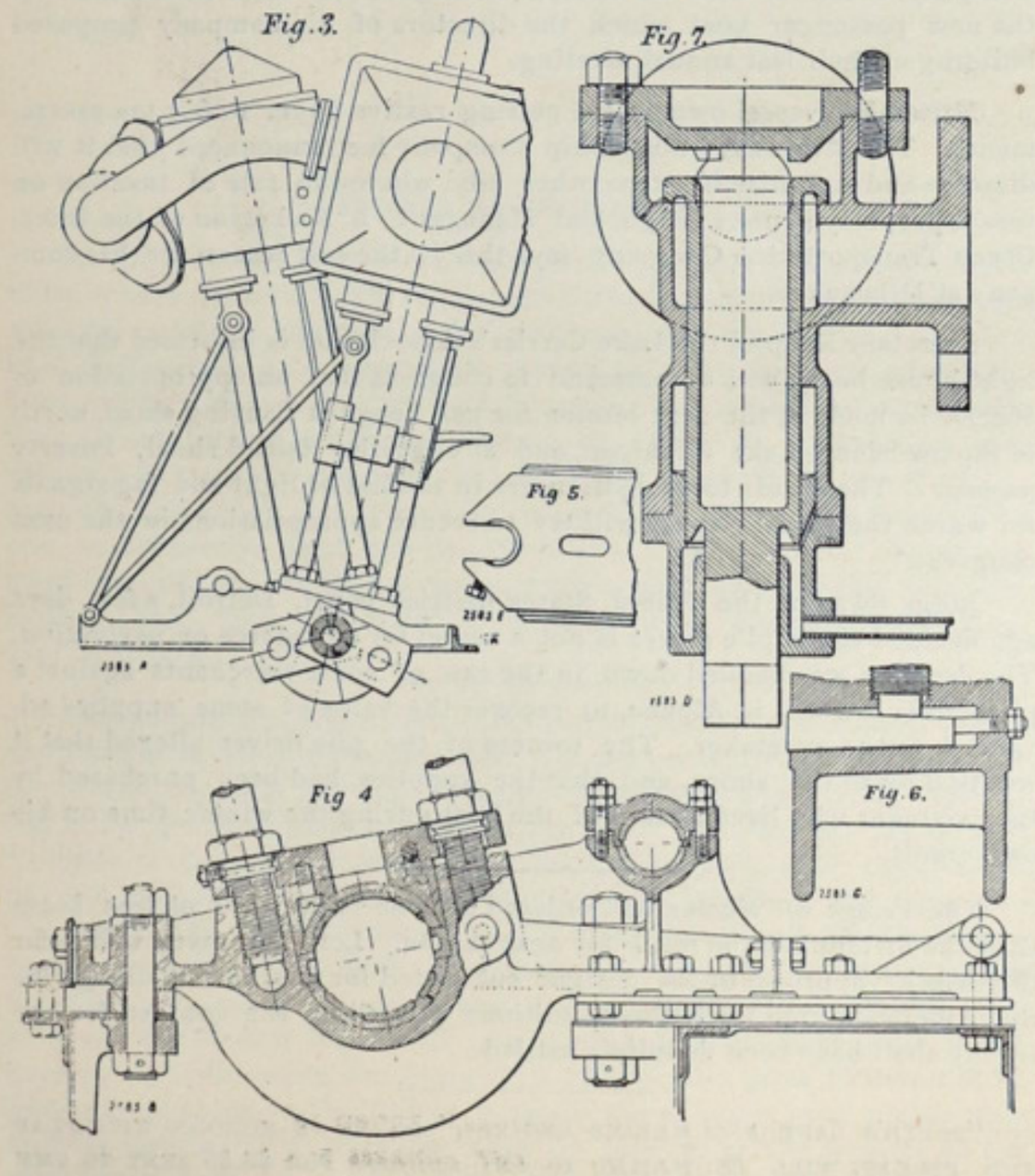


Fig. 2.

ENGINES OF THE DARING.




DETAIL OF DARING'S ENGINES.

followed of preventing end shake in columns. Figure 7 shows a steam reducing valve placed on connections between the high and intermediate cylin

## Miscellaneous Mention.

Contracts for government work have just been awarded through bids opened Saturday at the office of Maj. Sears, the government engineer at Duluth, as follows: William & Alex. McCurdy, $50.20 per lineal foot for constructing rip rap embankment at Agate bay; Samuel Menice $610 for constructing two base line stations on Minnesota point; for repairing north pier of Duluth canal, Edward McHugh, $5,699; repairing piers at Ontanagon, Mich., Dwyer & Amory, for removing old work and furnishing and placing in position new material, $15.50 per 1,000 feet, and for furnishing stone ballast in place $6 per cord. The successful bidders are all Duluth concerns.

The case of Gilbert vs. the Dominion government which arose some years ago out of the dredging contracts for the Galoup rapids has been settled at Ogdensburg. The claim was made by the contractors that in removing rock to make the required depth of 17 feet it was necessary, owing to the formation, to take it out in layers or strata, thus making the channel of an average depth of 19 feet. For this extra work, claims were filed amounting to $200,000 and about a year ago judgment was rendered in favor of the plaintiffs for that amount with costs. This was appealed from by the Crown attorney and later a tender was made of $149,000 which was accepted. It is said that the report of the engineer appointed to examine the channel since the completion, shows that the depth is in some places not more than ten feet. Very few vessel owners are willing to have their boats attempt the passage of the new channel.

The identity of the wreckage that went ashore at Fish point has been settled by Capt. L. E. Hollister of the D. M. Wilson, stating that the wreckage was from the Wilson, which went down off Thunder Bay island, Oct. 27. As missing boats have been accounted for he must be correct.

## Stocks of Grain at Lake Ports.

The following table, prepared from reports of the Chicago board of trade, shows the stocks of wheat and corn in store at the principal points of accumulation on the lakes on Nov. 10, 1894 :

| | Wheat, bu. | Corn, bu. |
|---|---|---|
| Chicago | 25,394,000 | 1,078,000 |
| Duluth | 4,209,000 | ..... |
| Milwaukee | 735,000 | ..... |
| Detroit | 1,458,000 | 6,000 |
| Toledo | 3,022,000 | 50,000 |
| Buffalo | 3,454,000 | 220,000 |
| Total | 38,272,000 | 1,354,000 |

At the points named there is a net increase for the week of 188,000 bushels of wheat, and a net decrease of 126,000 bushels of corn.

## Work Resumed on the North Land.

Some time since the REVIEW published an interview with Mr. F. P. Gordon, stating that the sister-ship to the North West would be completed in time for the opening of the passenger business season. As work was not commenced at once an erroneous impression that work would not be resumed this winter, was given out. This week about one hundred men were put at work to complete the boat, which is already half done, and will probably be launched in January. More men will be added from time to time as needed, but the work of plating and riveting, which required a small army of men, is so far accomplished, that the putting on of a hundred men means more than it would if such was not the case.

In a recent interview Mr. F. P. Gordon said, "The North West ran between 25,000 and 30,000 miles during the season, and is as perfect now as the day she came out. The new French marine boilers have proven a success, and no Scotch boiler could ever have stood the test. They are simply perfect."

Capt. B. B. Inman will have a dock constructed on Minnesota point at Duluth this winter. Next season the headquarters of the Inman fleet will be at the new dock.

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SEND 20 CENTS IN STAMPS AND HAVE A COPY OF THF COLOR ETCHING OF THE STEEL STEAMER GRATWICK MAILED TO YOUR ADDRESS OR TO THE ADDRESS OF SOME FRIEND WHOM YOU WISH TO PLEASE. MARINE REVIEW, 516 PERRY-PAYNE BUILDING, CLEVELAND, O.

## THE BATTLE OF THE BOILERS.

SANDY TO JEAN CRAPAUD:

"Says Sandy Scot to Jean Crapaud, I think ye are extra windy—
Your tongue runs like an oiler, Respectin' that toy water box,
The which you call a boiler.

I'll gee ye chance to show its worth—You put your water in the stove
And clap the fire into the kettle, And then ye claim ye ain the earth—
Hould! Crapaud I'm on me mettle.

We ha' a boiler o' our ain, that has served for several years,
The which, we are somewhat proud on'O,' coals she burns a quarter less—
And althegither she's a snod one.

In coarse the pressure's na sa great, A' this I am free to ain ye,
But don't ye lee aboon the weight, Send on your box, I'll stop yer crawin'
And Sandy will pay you half the freight.

When the trial's done and over, Ye'll want some tubes, I'm thinkin'—
That go out and in so quickly, And ye'll need mair an twa fifty pound
To keep up your blawin' slickly.

It's true ye 'snoov-ed' puir John Bull, Wi' all pour powerful fancies,
To puttin' them in his navy; But wait till the trial's over,
Salt-petre will na save ye."

JEAN CRAPAUD TO MON SANDY:

"We have ze pleasure of your information, And care not at all for the competition In the big navies are our *generateurs*,
We have been informed they are also in yours; When you are in need of high pressure, Your order we will highly *honneur*."

MARINE REVIEW

*DEVOTED TO THE LAKE MARINE AND KINDRED INTERESTS.*

Published every Thursday at No. 516 Perry-Payne building, Cleveland, O.

SUBSCRIPTION—$2.00 per year in advance. Single copies 10 cents each. Convenient binders sent, post paid, 75 cents. Advertising rates on application.

The books of the United States treasury department contain the names of 3,341 vessels, of 1,227,400.72 gross tons register in the lake trade. The lakes have more steam vessels of 1,000 to 2,500 tons than the combined ownership of this class of vessels in all other sections of the country. The number of steam vessels of 1,000 to 2,500 tons on the lakes on June 30, 1894, was 318 and their aggregate gross tonnage 525,778.57; in all other parts of the country the number of this class of vessels was, on the same date, 211 and their gross tonnage 314,016.65. The classification of the entire lake fleet on June 30, 1894, was as follows:

| Class. | Number. | Gross Tonnage. |
|---|---|---|
| Steam vessels | 1,731 | 843,239.65 |
| Sailing vessels | 1,139 | 302,985.31 |
| Canal boats | 386 | 41,961.25 |
| Barges | 85 | 39,214.51 |
| Total | 3,341 | 1,227,400.72 |

The gross registered tonnage of vessels built on the lakes during the past five years, according to the reports of the United States commissioner of navigation, is as follows:

| | Number. | Net Tonnage. |
|---|---|---|
| Year ending June 30, 1889 | 225 | 107,080.30 |
| " " " 1850 | 218 | 108,515.00 |
| " " " 1891 | 204 | 111,856.45 |
| " " " 1892 | 169 | 45,168.98 |
| " " " 1893 | 175 | 99,271.24 |
| Total | 991 | 471,891.97 |

ST. MARY'S FALLS AND SUEZ CANAL TRAFFIC.

| | St. Mary's Falls Canal. | | | Suez Canal. | | |
|---|---|---|---|---|---|---|
| | 1893. | 1892. | 1891. | 1893. | 1892. | 1891. |
| No. vessel passages | 12,008 | 12,580 | 10,191 | 3,341 | 3,559 | 4,207 |
| Ton'ge, net regist'd | 9,849,754 | 10,647,203 | 8,400,685 | 7,659,068 | 7,712,028 | 8,698,777 |
| Days of Navigation | 219 | 223 | 225 | 365 | 365 | 365 |

*Entered at Cleveland Post Office as Second-class Mail Matter.*

THE PRESENT is an opportune time to buy vessel property, and while saying this, readers of the REVIEW will bear us out in the statement that opionions based on political views or political conditions, whether with reference to the tariff, the shipping question or any other issue, have not found their way into these columns. Such opinions are at best somewhat biased. It must be admitted, however, that the result of congressional elections throughout the country last week must have a very favorable effect on lake commerce, at least as far as the business of next season and the following year is concerned. For two or three months previous to the election, reports to iron manufacturers from sales agents in all parts of the country were to the effect that buyers were pursuing a policy of meeting only their immediate wants, with a view to fixing upon a definite policy when the question of tariff legislation or no tariff legislation was settled. But aside from this matter of politics, men best posted in the vessel business have been satisfied, from the enormous consumption of iron ore that has been going on for several weeks past in the furnace territory tributary to the lakes, that even the increased ore shipments of the latter half of the present season are not sufficient to meet requirements up to the opening of another year, and that Bessemer ore will advance in price probably within a few weeks. This opinion applies particularly to Bessemer ores other than Mesabis, as the practice among furnacemen is still against a mixture of more than about 25 per cent. of the abundant supplies of ore from the new range. Turning to the question of improvement as it applies to vessels, it is understood, of course, that the opinion favorable to purchases refers to the class of modern ships capable of competing for large cargoes on low operating charges. It is not expected that the present indications of improvement will result in ship yards securing a great number of orders for new vessels, but the conditions are such as to warrant expectations of better returns in freights on a basis of about the capacity of the present lake fleet.

ALTHOUGH orders for new ships to be built on the lakes during the coming winter are very limited, the builders of steel vessels are not prepared to duplicate prices for which they offered to build large freight carriers at this time a year ago. The difference may not be very great, but builders look to the probability of somewhat higher prices for material, and the chance also of an increase in labor cost. Take for instance the steamer Nicholas, owned by the Minch estate of Cleveland, and which was probably constructed with less profit to the builders, the Cleveland Ship Building Company, than any other large steel steamer ever built on the lakes. She was built for $150,000, but sales of stock have since been made on a basis of $155,000. It is not at all probable that the builders of this boat would accept the former price, although it cannot be said that they have stated anything to the contrary. The Globe Iron Works Company has fixed a price on the steamer Globe, which went into commission a few weeks ago, and they are holding for the figure decided upon, with every prospect of securing it, on account of the favorable reception that the boat has received among people who know a good ship when they see it, and also on account of the change for the better in conditions bearing upon lake freights. Of course the price asked for the Globe is not made public but it is understood to be in the neighborhood of $170,000 cash.

IF THE votes of the leading Cleveland vessel owners are to decide the choice for president of the Lake Carriers' Association, at the meeting to be held at Detroit about the middle of January, William Livingstone, Jr., proprietor of the Detroit Journal and an extensive owner of vessel property, will be elected to the office. It has been quite generally understood since the last annual meeting that the presidency for the coming year should go to Detroit, and within the past few days it has been learned that Capt. E. M. Peck, whose name was mentioned in connection with that of Mr. Livingstone for the office, does not desire the honor. If elected, Mr. Livingstone will certainly make an excellent presiding officer. The great interest which he takes in all matters pertaining to the association and its affairs is well known to vessel owners. The present officers of the association are making special preparations for the coming meeting which promises to be the most important in the history of the organization. From present indications a new year will be begun with a balance in the treasury.

THE information given by "Salmagundi" in the Northwestern Lumberman, is satisfactory as far as Mr. Stephenson is concerned, but there is a matter of regulations for raft-towing that must run the gauntlet before these men: "Michigan will send three lumbermen to congress next session—Messrs. Stephenson, Linton and Crump. The Hon. Sam Stephenson is as brusque as a hedgehog, and has the reputation of being a watchdog in congress. He always stands ready to thrust out his foot and trip any fraud that may come his way. I don't believe a man would enjoy the afterclap of attempting to bribe him unless he should happen to have on soft-toed slippers at the time. His head is full of river and harbor improvements, and a congress without Mr. Stephenson on the rivers and harbors committee wouldn't be well put together."

SECRETARY HERBERT'S order placing responsibility for the stability of all United States naval vessels of the future with the bureau of construction, has met with general approval. In this action the secretary seeks to guard as far as possible against future errors like that which required the Machias and Castine to be cut in two and lengthened amidships in order to counteract their top-heaviness. All well regulated private ship yards follow this same rule, but it is too often the case, nevertheless, that the opinion of the naval architect, even in the private enterprises, is disregarded when it should be followed.

GEN. ALGER is said to be of the opinion that President James Corrigan of the Lake Carriers' Association "is a radical extremist" in matters that pertain to the advancement of vessel interests on the lakes. This is a compliment to Mr. Corrigan. Gen. Alger is in the raft towing business and Mr. Corrigan has opposed very vigorously his desire to monopolize the connecting rivers of the lakes with acres of logs.

## Cargo and Speed Records.—Lake Freight Steamers.

Iron ore.—S. S. Curry, Hawgood & Avery Transit Company of Cleveland, 4,569 gross or 5,117 net tons, Escanaba to South Chicago; Maritana, Minnesota Steamship Company of Cleveland, 4,260 gross or 4,771 net tons, Escanaba to South Chicago; Selwyn Eddy, Eddy Bros. of Bay City, Mich., 3,897 gross or 4,364 net tons, Escanaba to Ashtabula; Kearsarge, Interlake Company of Cleveland, 3,718 gross or 4,164 net tons, Escanaba to Cleveland.

Grain.—Selwyn Eddy, Eddy Transportation Company of Bay City 130,820 bushels of wheat, Detroit to Buffalo; Centurion, Hopkins Steam ship Company of St. Clair, Mich., 147,812 bushels of corn, Chicago to Erie; Onoko, Minch estate of Cleveland, 187,657 bushels oats, Chicago to Buffalo.

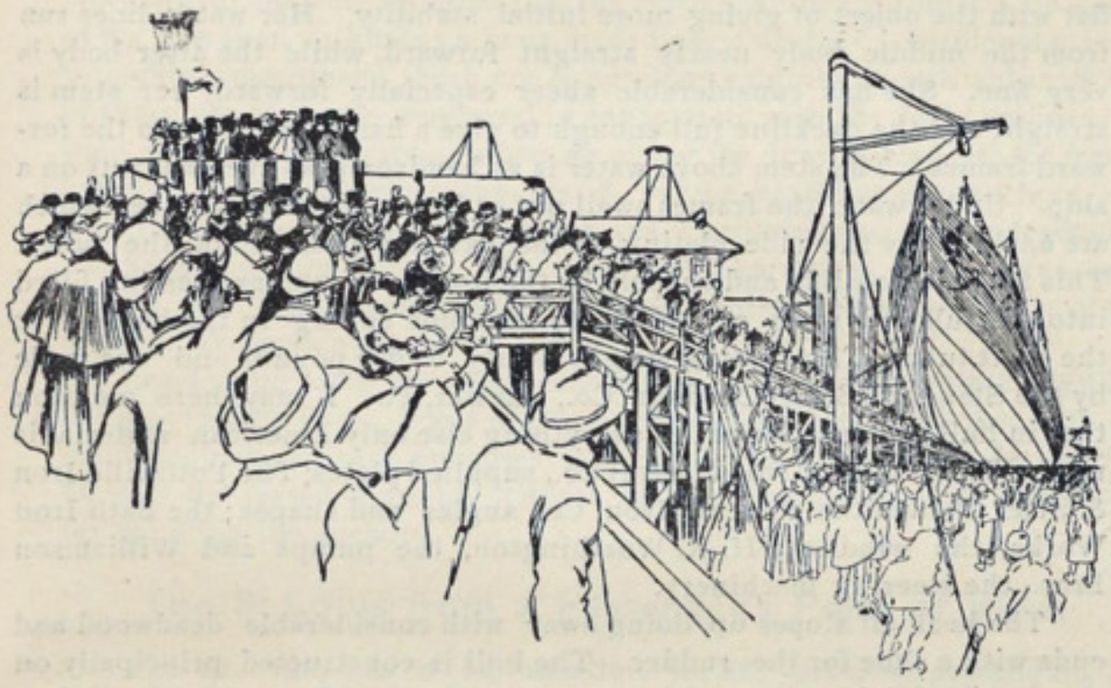
Coal.—S. S. Curry, Hawgood and Avery Transit Company of Cleveland, 4,535 net tons bituminous, Conneaut to Gladstone; Selwyn Eddy, Eddy Bros. of Bay City, Mich., 4,252 net tons anthracite, Buffalo to Milwaukee.

Speed.—Owego, Union Line of Buffalo, Buffalo to Chicago, 889 miles, 45 hours and 16 minutes, 16.4 miles an hour; Centurion, Hopkins Steamship Company of St. Clair, Mich., Buffalo to Duluth, 997 miles, 67 hours and 50 minutes, 14.7 miles an hour.

# THIRTY THOUSAND PEOPLE

## ATTEND THE LAUNCH OF THE AMERICAN LINE STEAMSHIP ST. LOUIS—INDICATIONS OF A NEW ERA IN THE HISTORY OF AMERICAN COMMERCE—THE PRESIDENT AND CABINET WITH LEADING MEN OF THE UNITED STATES WITNESS A GREAT EVENT AT PHILADELPHIA.

PHILADELPHIA, PA., Nov. 12.—Full 30,000 people saw the steamship St. Louis launched here to-day, and the event was marked by a demonstration that exceeded in magnitude anything that has ever occurred in connection with the country's shipping. And from the argument that the ship builders of the United States are gradually finding material and labor at costs that will soon enable them to compete successfully with Great Britain in the ship building business, there was a national feature of enthusiasm in to-day's proceeding at the ship yard of the Cramps that



bespeaks a return of American shipping interests. The launching of the world's greatest cruiser, the Minneapolis, and the pomp and ceremony attending the christening of vessels of war like the New York, were insignificant as compared with the salute that was given by the president, members of his cabinet and thousands of other men from all parts of the country to this great merchant ship.

The St. Louis, built by the William Cramp & Sons Ship and Engine Building Company for the American Line, is the largest and most powerful steamship ever constructed in the western hemisphere, and with two exceptions—the Cunarders Campania and Lucania—the largest and most powerful in the world. It was fitting, then, that the launch should be attended by statesmen, representatives of commercial bodies and leading ship builders and ship owners from all parts of the country. The presidential party came from Washington on a special train that was taken direct to the ship yard, and as the journey was one of only a few hours coming and returning, practically the entire cabinet was represented. The party included the president and Mrs. Cleveland, the vice president and Mrs. Stevenson, all of the secretaries and their ladies, Gen. James A. Dumont of the steamboat inspection service, Commissioner of Navigation Chamberlain and several other officers of the different departments. From St. Louis, the city for which the boat is named, there was a large delegation headed by Mayor Wallbridge, and the guests from New York included such men of wealth and prominence as Hon. Chauncy M. Depew, Bourke Cockran, Hon Charles S. Fairchilds, Geo. J. Gould, J. Pierpont Morgan, John D. Rockefeller, Whitelaw Reid, Joseph Pulitzer, Gen. B. F. Tracy, Hon. W. C. Whitney, Capt. Robley D. Evans, Edwin Gould, Howard Gould, Frank J. Gould, W. H. Webb and Bancroft Gerhardi.

From the lakes, the only ship building company represented was the Detroit Dry Dock Company, four of the principals of that concern, Messrs. Frank E. Kirby, S. A. Kirby, Gilbert N. McMillan and C. B. Calder being present. Messrs. Kirby and McMillan were on their way to Europe, but they would probably have been here anyhow, as, to use Mr. Kirby's language, "they want to know what others are doing; to profit by adapting new ideas or discarding such as have proved unsuccessful."

A banquet, given on a very extensive scale in one of the shops that had been prepared for the purpose, followed the launching, and it was attended by speeches from President Cleveland, Charles H. Cramp, Clement A. Griscom and Secretary Herbert, but readers of the REVIEW are not as much interested in this part of the proceedings as they are in the description of the boat that follows in another chapter, and in the preparations made for handling such a vast throng of people and carrying out a launch on such an extensive scale.

The item of expense covering the launch was certainly very heavy, whether borne by the Cramps or the International Company. No less than 500 police, with captains, lieutenants and sergeants on every hand, were required to guard the various entrances to the ship yard, where tickets admitting the holders to the various stands surrounding the bow and sides of the ship were taken up. These stands were immense affairs, very firmly constructed, and each holding thousands of people. Decorations of bunting and flags were seen everywhere, and the Delaware with hundreds of passenger boats, large and small, presented a magnificent sight. The bow stand, from which the presidential party, the St. Louis officials and other specially invited guests witnessed the launch, was built under the stem of the St. Louis, around both port and starboard sides for a distance of 30 feet or more and was inclined upward towards its rear where a temporary bridge made a direct connection with the shops in which the banquet and other ceremonies were carried out. The rails on either side of this bridge and on all sides of the stand were so well covered with red, white and blue bunting that little of the wood-work could be seen. In the middle of the stand was a large pole from which the American ensign was hanging, while each of the four corners were similarly decorated. On the port side of the vessel's stem, near the spot where Mrs. Cleveland stood, another large pole had been erected, and to it was attached the white flag bearing the coat-of-arms of the United States. Three jury masts had been erected on the ship, and a line connecting them was entirely covered with bunting. The Union Jack floated from a pole at the bow, and from the after pole a large American ensign waved over the ship. The great mass of people on four other big stands, on the St. Paul and throughout all parts of the ship yard was a sight probably never before witnessed in any ship building establishment in the world.

The army of workmen who took their posts at the wedges with battering rams—five men to a ram—at a signal from Chief Constructor Lewis Nixon, late lieutenant, United States navy, had not been noticed in the throng. Their number as they appeared in double column on either side of the keel seemed very great, on account of height to which the bow of a big ship of this kind is raised for an end launch. This work was begun about forty-five minutes before the ship slid into the water. Spaces made bare by the removal of the shores, were painted by another large detail of workmen, who carried paint pots and brushes on long handles. When the shores were all removed the ship rested on her cradle, which was 420 feet long, and the cradle in turn rested on the ways, which were each a yard wide. Several thousand pounds of tallow and a dozen or more barrels of oil had been used in greasing the ways. The cradle with its massive burden moved almost immediately after being released, and the impressive sight that followed was enjoyed especially by such of the guests as had never witnessed an end launch of so large a ship. The descent is great and the excitement more lasting. Anchors were dropped from the bow as soon as the ways were cleared. One of the chains parted but the ship ceased moving when well out from the opposite bank of the river, and she appeared larger at a distance of more than a quarter of a mile in the water than she did when on the stocks. Cannon shot signalized the launch and the president's flag of blue with a shield, eagle and fifteen stars was run up near the bow. The bottle with which Mrs. Cleveland christened the ship, contained a pint of champagne of the vintage of 1859, and was covered with gold bullion netting, with navy blue and white ribbons and gold tassels. Around the bottom was a blue band with the house flag of the International Navigation Company.

All eyes were, of course, strained to see Mrs. Cleveland. She held quite a little reception on the launching stand and her smiles caused a pleasant feeling to run through the crowd. Photographers got their snap shots and the thousands of people around her surged and crowded without disturbing her. She missed the first blow aimed at the bow with the bottle, and had to reach with an extra effort to consumate the christening before the bow had gone beyond reaching distance.

The mould loft which had been made into a banquet room and to which the specially invited guests adjourned immediately after the launch is 300 feet long and afforded sufficient room for the festivities. The presidential table was laid in the form of an anchor, and was bedecked with smilax, Jacqueminot and La France roses.

In responding to the health of the president of the United States, Mr. Cleveland said:

"I can not keep out of mind the feeling that the gratification appropriately growing out of this occasion is such as must be shared by every patriotic American, and that the important event which has just now taken place is of such national interest that it is fittingly witnessed by the highest officials of our government. We shall fail to realize the full significance of what we have seen to-day, if we overlook the fact that the causes of our congratulation reach beyond actual accomplishment, and are not limited to the things already done and within our sight. While we may well be proud because we have launched such a ship as this, and while we may find reason for additional pride in the fact that notwithstanding general economic conditions discouraging to such achievements, this great vessel has been built on American plans (applause), by American

mechanics (applause) and of American materials (applause), we must not forget that our greatest cause of congratulation is found in the hope and promise these incidents furnish of the revival and development of American commerce and the renewed appearance of the American flag in foreign ports.

"I hope I shall not be accused of making a suggestion calculated to mar the gratification which this occasion inspires, if I remind you that the ship we have just launched was built in fulfillment of conditions imposed in consideration of the relaxation of our registry laws, and that the constructive plant and machinery to build this ship on American plans, byAmerican mechanics and ofAmerican materials originated in the necessity for the building of an American navy. There should be no more delay in the work of re-instating American commerce, not only by the inspiration supplied by such events as we have this day witnessed, but by such legislation as will set free American mechanical industry and excite American enterprise. Commerce is the life-blood of a nation, and no country that loses or impoverishes it can reach and maintain a commanding position among the nations of the earth. Our flag not only tells of our existence, but it is a symbol of all that American institutions represent. It is glorious and patriotic to uphold our flag and to follow it and defend it; but it is also glorious and patriotic to carry our flag to all parts of the world, and to extend its defense and protection to American men and American property in the ports of every nation. I am not able to see why Americans owning ships, navigated by Americans and carrying American cargoes should in any case be driven to the protection of a foreign flag, and it seems to me that the stars and stripes entering a port of the United States and spread over Americans and American property should never be frowned upon and repelled by American officials acting under the mandate of our navigation laws. In the interest of a revival of American commerce so much needed and for the honor of our flag so dear to us all, I am willing that the defence of our government and flag shall be accorded to all ships of American ownership wherever built. Make our flag a more familiar sight in the ocean carrying trade, and thus remind our citizens that a large share of the carrying trade of the world is due to them, and we need have no fear that our ship builders, under laws giving them a fair chance, will suffer from foreign competition.

"Since my participation in rebuilding our navy during a former official term has been so flatteringly referred to, I hope it is not amiss for me to say that I shall deem myself especially fortunate if in time to come it can be said that I have done something during my present incumbency in aid of the freedom and extension of American commerce and the consequent further growth of American ship building."

## The St. Louis as Viewed by Builders.

The steamship St. Louis, which is the first of the two vessels being built for the American Line by the William Cramp & Sons Ship and Engine Building Company, is the first large trans-Atlantic steamer that has been built in this country since the four American boats, Pennsylvania, Indiana, Ohio and Illinois, which were built in the early seventies, and which are now running in the American Line between Philadelphia and Liverpool.

The first frames of the St. Louis were raised on the 27th day of July, 1893, taking 15 months and 16 days from the beginning of her construction to the time of her launch, during which time something over 6,000 tons of steel has been worked into her hull, while the construction of her boilers and machinery has kept equal pace in the engineering department, and they are now ready to be erected on board.

It is worthy of note that these steamships are built of domestic material throughout. They are of American model and design, American material, and they are being built by American skill and muscle.

The policy which produced the St. Louis and the St. Paul was inaugurated about the year 1891 by the International Navigation Company, the only organization of American capital in the North Atlantic trade. Among the ships owned by that company were the two great twin-screw greyhounds the New York and the Paris, and Mr. C. A. Griscom, president of the company, proposed to congress that if an act were passed which would admit these ships to American registry, he would cause two other vessels of at least equal tonnage to be built in the United States. A bill to this effect, which was introduced in the House of Representatives by Mr. W. Bourke Cockran, of New York, became a law in 1892, and the International company then placed an order with the William Cramp & Sons Ship and Engine Building Company, for the vessels required to meet its provisions.

The principal dimensions of the St. Louis are:

| | |
|---|---|
| Length over all | 554 feet 2 inches |
| Length on loadwater line | 535 " 8 " |
| Extreme beam | 63 " |
| Depth of hold | 42 " |
| Draught of water | 26 " |
| Displacement at 26 feet | 16,000 tons |
| Gross Register | 11,000 " |

The steamer has two funnels, about 11 feet 6 inches by 14 feet, the tops being nearly 100 feet from the grate. She is rigged with two steel masts, and wooden topmasts. A bridge runs clear across the ship on top of the houses, on shade deck and back of the bridge is the pilot house. Forward on the promenade deck is the Bath windlass, two capstans and several deck hoists. Hall and Trotman stockless anchors will be used, doing away with anchor cranes. She is expected to carry 1,500 tons of freight and can easily be converted into an auxiliary cruiser carrying eight 6 inch rapid fire guns. The shell-plating is lap-butted, and the rudder is of the single plate type. The vessel is so divided by bulkheads that any two, and in some cases three, compartments may be filled with water at the same time without endangering the safe flotation of the ship.

The material used in the construction of this vessel is mild steel of the best quality, and the records of its inspection show an average considerably above Lloyd's standard.

## The St. Louis as Viewed by a Naval Architect.

The St. Louis certainly has a beautiful model, with harmonious proportions and perfect lines. The bottom is rather flat with little deadrise but that gives her bilge a chance to be round and easy, the bottom being flat with the object of giving more initial stability. Her water lines run from the middle body nearly straight forward, while the after body is very fine. She has considerable sheer especially forward, her stem is straight and the deckline full enough to give a handsome flare to the forward frames. The stem above water is as handsome as ever was put on a ship. Under water the frames swell out and around the shaft tubes which are enclosed by the side plating to the extreme after end of the tubes. This is made possible and shapely by the use of an immense casting fitted into the hull with arms extending to each side ending in the bosses for the shaft tube. This casting weighs nearly 68,000 pounds and was made by the Standard Steel Castings Co., Chester, Pa. I may here mention that in hull construction as in everything else only American material is used. The Wellman Iron & Steel Co., supplied plates; The Pottsville Iron & Steel Co. and the Phoenix Iron Co., angles and shapes; the Bath Iron Works, the windlass; H. R. Worthington, the pumps and Williamson Bros., the steering machinery.

The keel aft slopes up, doing away with considerable deadwood and ends with a shoe for the rudder. The hull is constructed principally on the longitudinal system with strong continuous fore and aft girders connected to belt frames with diamond plates and angles. Frames between belts are made of channel bars and so are most of the deck beams. The bottom framing is on the bracket system built of angles and plates, but contains many improvements notable for great simplicity and strength. The inner bottom or inner hull stands 54 inches above the keel and can be used for water ballasts, although the builders claim enough stability to make ballast carrying unnecessary. Still they have a ballast pumping system that is very complete. The inner bottom compartments or tanks can be filled from the outside through independent sea valves, or the water ballast can be shifted from forward to aft, or from port to starboard at will, as the trimming requires. Two powerful Worthington pumps do that work. The St. Louis would remain seaworthy with two, or even three compartments flooded. Bilge water is taken care of by two bilge pumps, which through a main suction pipe draws from every compartment. Two fire pumps serve also as auxiliary bilge pumps. Two sanitary pumps regulate the filling of smaller tanks, flushing of closets, etc.

The hull plating averages ¾ inch thickness. It is lapped throughout, which gives the same strength but less weight than the ordinary butt-strap method. The sheerstrake is an exception and is double strapped. The plating extends up the promenade deck forward and aft, while amidships the saloon deck has a steel bulwark. The rudder presents some novel and interesting features, being built of one plate held by a frame with ribs outside on each side. This plate is notable for being one of the largest plates ever rolled in any country. It is nearly 37 feet long, 12 feet wide and 1 inch thick and weighs nearly five tons.

## The St. Louis from the Marine Engineering Point of View.

To guard against such a breakdown of machinery as would disable these steamers they are fitted with two sets of engines, each set driving a separate screw. They are said to be the largest of the type in the world.

The engines are in two separate water-tight compartments, and the boilers are in separate compartments, completely cut off from each other, so that the vessels might in collision be struck on any bulkhead and could have a breakdown of their machinery, such as may occur to any ordinary ship, and still be quite navigable, and thoroughly seaworthy. While, therefore, the vessels are well provided for against the effects of collision, they are also much better able to avoid collision by having two sets of machinery, one of which could be readily reversed while the other was going ahead, thus turning the vessel in her own length. The law under, which these steamers are built, stipulates, among other things, that they may be taken and used by the United States as transports or cruisers, and that

they shall be of sufficient strength and stability to carry and sustain the working and operation of at least four six-inch rifle cannon. The specifications of the secretary of navy to enable these ships to accomplish this latter condition have been more than fulfilled in their constructions, and when it is considered that their boilers and engines can be protected by coal or other suitable material, that they are fitted with twin-screw engines and have a rudder area by which their maneuvering power will be very great, and in view of their high speed, they will become, if needed, most effective naval cruisers, and in this connection their very great coal endurance should not be forgotten. They can carry coal enough, cargo being excluded, to cross the Atlantic and return at their highest speed, and at the ordinary cruiser's speed of 10 to 12 knots, they can steam for 66 days without replenishing their coal, a distance of 19,000 knots.

The engines are quadruple expansion, vertical, six-cylinder, on four cranks. Steam at 200 pounds pressure is supplied by six double-ended and four single-ended boilers. The engines are calculated to develop about 18,000 to 20,000 collective I. H. P. No prediction as to actual performance will be offered by the management, but it is well-known that the contract between the United States post office department and the International Navigation Company requires that the ships shall be capable of a sea-speed of not less than 20 knots an hour, in ordinary weather. Besides the main propelling machinery, there are 49 auxiliary engines in each ship. Some of these are of course employed in connection with the main engines, for such purposes as pumping water or air, or for driving blowers for forced draught, or for steering the vessel, or for handling the anchors, etc. Twelve engines are used for lighting and ventilating the ship, independent the propelling machinery. The steering apparatus is of the screw gear of type, with Williamson's steam and hand steering. The anchors are of the Hall and Trotman patterns.

Besides the main propelling machinery there are forty-nine auxillary engines in each ship. Some of these are employed in connection with the main engines, for such purposes as pumping water or air, or for driving blowers for forced draught. Others are used for steering the vessel and for handling the anchors.

## The St.Louis from a Passenger's Point of View.

The St.Louis has accommodations for 320 first-class passengers, 200 second-class, and about 800 steerage. She has five decks. On the upper or saloon deck, is a deck house extending fore and aft with a passageway 7 feet wide on each side, on which the traffic of the ship is conducted. The passenger enters this deck house at several places, but the principal entrance is just forward the foremost funnel, where a spacious staircase arises to the promenade deck, which is on top of this main deck house, and descends to the first cabin sleeping cabins on the two decks beneath. In the hallway surrounding this staircase are the rooms of the purser and chief steward, easily accessible to passengers. The forward end of this hall opens into the library. This is probably the largest reading room afloat; and is handsomely fitted up in oak, and furnished with book-cases, writing tables, comfortable seats, and a plentiful supply of books selected from standard literature, for the use of passengers.

The after end of the hall opens direct into the grand dining saloon, which is thus situated nearly amidships, between the funnels and the upper deck of the ship, which is a deck higher than is the case in any large trans-Atlantic steamer, excepting the New York and Paris, and three of the other steamers of this company. This room is handsomely decorated, and finished in white mahogany, which gives it a very cheerful, bright appearance. It is 110 feet long by 50 feet wide, and will seat all of the 320 first cabin passengers at one sitting. It is well lighted from the sides and above from a large dome, in one end of which is an organ, played from a keyboard placed in one end of the saloon. In addition to the saloon being situated amidships, where the motion of the vessel is least appreciable, the tables are arranged in a fore and aft direction which obviates the discomfort of side motions when the ship is rolling. There is also a companionway on the promenade deck into the lobby at the after end of the saloon, so that if a passenger desires he can enter from this end. The pantries on this ship are not easy for a passenger to find, as he does not have to pass and repass them in going to and from his meals, as is often the case. This will be a great comfort to passengers who are inclined to be sea-sick. They are situated immediately abaft the saloon, so that the passengers can be promptly and efficiently served. Abaft the pantries and between the engine-room skylights, is situated the engineers' mess-room; and abaft this again, but in communication with the first cabin pantry is the second cabin pantry which is at the forward end of the second cabin dining saloon. This room is very large and well lighted. It will accommodate about 200 passengers. The tables are arranged in a fore and aft direction; and chairs instead of the usual settees are provided. Between the engine casings is situated the deck pantry, from which passengers on this deck can be promptly and well served, on deck, if they are not feeling well enough to go to the regular meals in the main dining saloon. This pantry is in direct communication, by a lift, with the main pantry on the deck below, and with the kitchen on the deck below the pantry. Next to this is the barber shop, which is of course perfectly appointed. Abaft this is situated the doctor's office and dispensary, where it will be accessible to all passengers. In the after end of the ship is situated crew quarters, steerage lavatories, hospitals etc.

In a house by itself, a very modern feature of the ship, is situated the mail sorting room and the mail clerk's rooms. It is well known that this ship is under contract with the government to carry the trans-Atlantic United States mail, and everything is most conveniently arranged for this purpose. The mail room is situated in the after hold, and is reached by a special hatch for this use only. The mail sorting room is fitted up as is usually the case in post offices on land, and the mail will be sorted while in transit.

Returning to the main companionway you ascend to the deck above, or promenade deck, which is continuous from one end of the ship to the other, and on this unbroken stretch of deck passengers can walk, sheltered almost the whole length from the sun and rain by an awning deck carried out to the sides of the ship. It is on this deck that passengers spend most of their time during the day. In the forward end of the house on this deck, immediately forward the grand staircase are six suites of rooms comprising bedroom, bath-room and sitting-room, furnished in the very best manner possible. They are all reached from the inside of the house, so that it will not be necessary for a passenger to go outside to reach the saloon, or other rooms on this deck.

Directly abaft the main companionway, and opening into it, is the drawing room, fitted in white and gold, and furnished most luxuriously with comfortable lounges, seats, a piano and a keyboard by which the organ in the dome can be played. Abaft the drawing room on the promenade deck are situated groups of suites of rooms, containing bath, etc., and deck cabins, all accessible from the inside of the house from either forward or aft. Baths are also provided on the promenade deck convenient to all the deck cabins. Abaft this group of rooms, and forward of the engine room skylights, is a spacious companionway leading down to the after end of the saloon and the sleeping decks, which can be used if desired instead of the main companionway forward.

There are ample lavatories and water closets for the accommodation of the passengers on this deck. These as well as all other lavatories and water closets throughout the ship, are fitted up with the most modern sanitary appliances of the most approved plan.

Abaft this, at the after end of the first cabin promenade, is situated the first cabin smoking room in a separate house. It is a very large and well-ventilated room, fitted up in mahogany. The seats and tables are arranged in a very convenient manner to meet the requirements of a smoking room. The seating capacity of the room is nearly 100. Attached to the smoking room is a bar, so that passengers can be quickly and efficiently served. Abaft the smoking room is situated the second cabin ladies room and the second cabin companionway; and abaft this again in a house by itself is situated a large and well-appointed second cabin smoking room.

Returning to the saloon deck, and from there descending through the main companionway to the next deck below, one comes to the upper deck, or the first sleeping deck occupied entirely by passengers. The first cabin rooms are situated amidships; the second cabin rooms immediately abaft the machinery space; the steerages forward and aft of these; and the crew quarters forward and aft of the steerages. The next deck, or main deck, is devoted to the same purpose and divided up in the same way. The staterooms on these decks will be found to be larger than usual, and very well lighted and ventilated. They are fitted up in the most convenient manner; and the beds will be found unequalled for comfort, and are all six feet six inches long. There are an unusual large number of baths and water closets for the accommodation of the passengers on these decks The second cabin staterooms are lighted and ventilated similarly to the first cabin rooms, and all berths and fittings are essentially first class. Special care has been taken to make the second cabin in all respects desirable.

The steerages are without doubt unexcelled. They are lighted and heated by the same process as is used for the first and second compartments. The berths are metallic with spring bottoms; and nearly all the steerages are fitted up in rooms. Tables and seats are provided in each compartment; and the pantries being on the steerage decks ensures promptness in serving the food. The steerage lavatories and water closets are of the most approved design. Special care has been exercised throughout the ship to have the sanitary and drainage systems the most complete, and on the latest principles in every respect. The hospitals are well placed at both ends of the ship, isolated from all passenger compartments and fitted up in the most approved manner.

Particular attention has been paid to the very important question of ventilation and heating this ship, and it is believed that the system adopted, which extends to every compartment in the ship, is the most perfect in existence. The air is exhausted from every room and com-

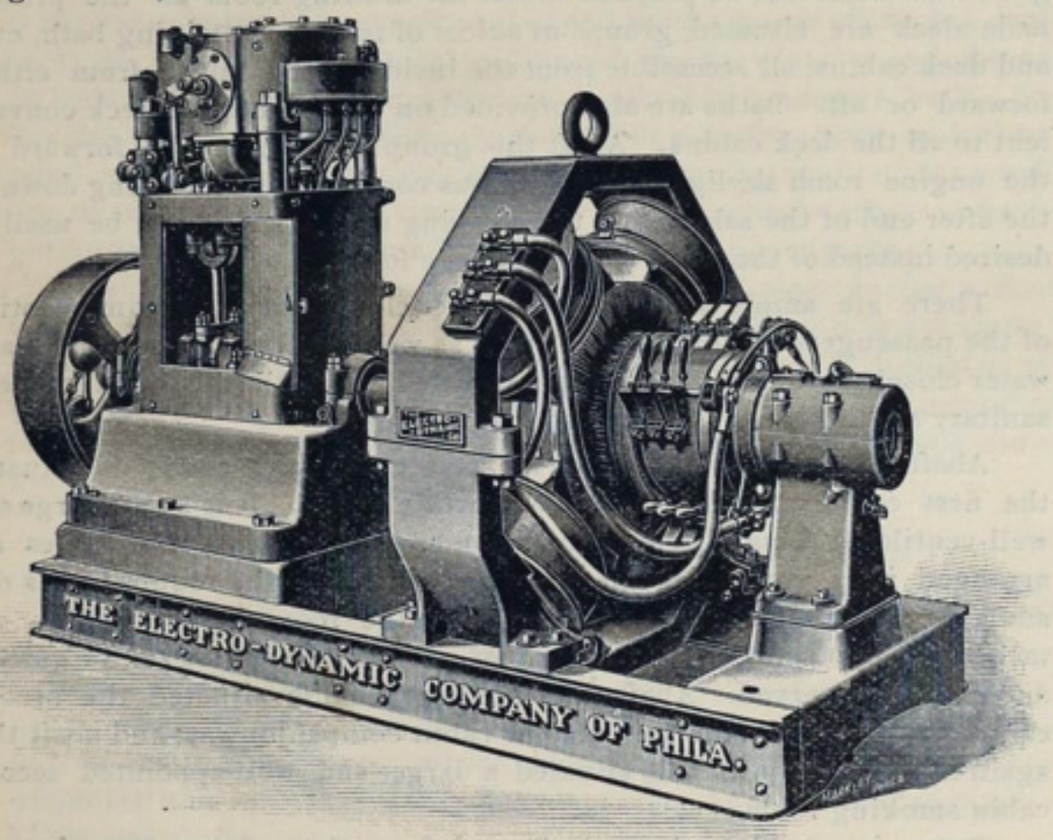
partment by the aid of fans situated in several places on the ship, and, fresh air drawn from the outside of the ship will be forced through every compartment and in cold weather this air will be heated. By this means the entire air in the ship can be changed every ten minutes, and each passenger can control the temperature of his own room.

Although the ships are practically unsinkable, they are provided with complete boat accommodations for every soul on board, there being 14 life boats, 14 Chambers' collapsible life boats, 1 cutter, 1 gig, and 4 metal life boats, all secured to and operated from the shade deck. The means of rapidly lowering every boat has also received special attention. In these ways as well as in many others has the safety, which should always be the first consideration in a passenger ship, been provided for.

To navigate each of these ships and to meet the needs of their passengers the following normal complement of officers, seamen, engine room and fire room hands and attendants has been fixed upon:—Captain, 1; officers, 6; seamen, 48; fireman, 120; engineers and machinists, 30; stewards and cooks, 124; stewardesses, 16; chefs de cusine, 2; mail clerks, 2; doctor, 1; purser, 1; printer, 1. Total 381.

## The Electrical Equipment of the St. Louis.

The electric light and power plant of the steamship St. Louis was supplied by the Electro-Dynamic Company of Philadelphia, who will also equip its sister-ship the St. Paul. They have had much experience in this class of work, and for compactness, noislessness and efficiency this installation will stand as a model of its class. There are four generating sets each of sixty horse power, consisting of a direct coupled engine and dynamo upon a single bed plate, running at the rate of 450 revolutions per minute. They are installed in a special dynamo room located just forward of the engine room, in which also is the switchboard which controls all the cir-




ONE OF FOUR GENERATING SETS, STEAMSHIP ST. LOUIS.

cuits on the ship. By this isolation a much better arrangement of the electric machinery is secured than by installing the electric plant in the engine room as has heretofore been customary. As economy of space is a matter of great importance on steamships, a Sturtevant vertical engine is used with two 9 inches by 5½ inches cylinders. This stands but six feet high which is but little higher than the dynamo itself. The dynamo is of the slow speed "L" of the Electro-Dynamic Company, multipolar, compound wound and with self-oiling bearings and ample commutator. The four sets are connected to the marble switchboard and the circuit switches thereon are so arranged that any light or power circuit can be connected with any dynamo, or two or more dynamos can be connected in parallel so that any desired combination can be made. The combined requirements of the motor's operating ventilating and heating fans and the refrigerating apparatus are about equal to 60 horse power, or a load of one set. The total number of 16 candle power lamps to be supplied is 1,200, or a load for two sets if all were lighted. The wiring system has been very carefully designed to meet the demands of convenience and safety. It is divided generally into police and general lighting circuits, and these are further divided at sub-centres of distribution, at which points a convenient and water tight distribution box is placed, with switches and fuses to control the sub-circuits. These closets were especially designed for the St. Louis, and are the first of the waterproof type to be used on any vessel. The wire is all of the highest type of water-proof insulation, selected after the severest tests by water, heat and cold. Many new designs of switches protective shades, fixtures, etc. of great beauty and excellence were prepared especially for this vessel.

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# MEN WHO BUILD SHIPS.

## SECOND ANNUAL MEETING OF THE SOCIETY OF NAVAL ARCHITECTS AND MARINE ENGINEERS—PROSPERITY OF THE SOCIETY SPEAKS WELL FOR THE FUTURE OF AMERICAN SHIPPING—A CHARACTERISTIC PAPER FROM REAR ADMIRAL MEADE ENLIVENS THE PROCEEDINGS—DISCUSSION ATTENDING THE READING OF ALL MANNER OF PAPERS DEVOTED TO SHIPS, SHIP BUILDERS AND SHIP OWNERS.

NEW YORK, N. Y.. Nov. 17.—Although practically only a year old, the society of Naval Architects and Marine Engineers, which held its second meeting here this week, has a membership of 455, and new members to be taken in as a result of the present gathering will bring the number close to 500. This certainly speaks well for the movement towards a new merchant marine, which is to receive its greatest support from the new organization, in which naval officers and ship builders are working together with a single aim—the advancement of everything maritime.

There was no lack of interest, even at the outset of the meeting. Rear-Admiral Richard W. Meade, who, on account of his position as a sailor in the navy, as he sees fit to put it himself, is only an associate member of the society, had been invited to present a paper on "Some Suggestions of Professional Experience in Connection with the Naval Construction of the Past Ten Years." He has all the dash of an admiral and an excellent command of language, and when he declared at the opening of the first meeting that the practical men of his profession looked upon the cruisers Columbia and Minneapolis and those of the Detroit class as vessels that are least satisfactory in the navy, a discussion was precipitated that was not at all lacking in interest, however little the gallant head of the North Atlantic squadron may have had in argument to support his claims.

Before proceeding with a report of the discussion of papers a list of the distinguished men present at the gathering, which assembled for the first session on Thursday morning at headquarters of the American Society of Mechanical Engineers, No. 12 West Thirty-First street, will probably prove interesting. The lakes were represented by Mr. John F. Pankhurst of the Globe Iron Works Company, Cleveland, Messrs. Frank E. and F. A. Kirby of the Detroit Dry Dock Company, and Constructing Engineer Calder and Secretary Gilbert N. McMillan of the same company. Mr. Pankhurst was the guest of Mr. J. F. Holloway of this city, and Messrs. Frank E. Kirby and Gilbert N. McMillan were on their way to the ship yards of England and Scotland, while Messrs. F. A. Kirby and C. B. Calder remained to attend the meeting on their way home from the launch of the American Line steamer St. Louis at Philadelphia. A list of all members of the society in attendance, as far as it could be secured, follows:

Clement A. Griscom, Philadelphia; Theodore D. Wilson, U. S. N., Washington; William H. Webb, New York; William H. Jaques, New York; Edwin A. Stevens, Hoboken, N. J.; Charles A. Cramp, Philadelphia; Martin A. Anderson, U. S. N., Washington; William Joseph Baxter, U. S. N., Norfolk, Va.; Francis T. Bowles, U. S. N., Norfolk; Washington L. Capps, U. S. N. Washington, William Cowles, New York; Irving Cox, New York; Edwin S. Cramp, Philadelphia; Marshall T. Davidson, Brooklyn; James E. Denton, Hoboken, N. J.; Frank L. DuBosque, Jersey City; Charles Edward Emery, E. D., New York; Joseph Feaster, U. S. N., Philadelphia; Geo. R. Ferguson, Brooklyn; Frank L. Fernald, U. S. N., New York; William H. Fletcher, Hoboken; Charles R. Hanscom, Bath, Me.; John F. Hanscom, U. S. N., Philadelphia; Alexander Henderson, U. S. N., New York; Philip Hichborn, Washington; Warren E. Hill, Brooklyn; J. F. Holloway, New York; John B. Hoover, U. S. N., Portsmouth, N. H.; John C. Kafer, New York; Leopald Katzenstein, New York; Frank B. King, Sparrows' Point, Md.; Joseph H. Linnard, U. S. N., Philadelphia; Charles H. Loring, U. S. N., Brooklyn; Walter M. McFarland, U. S. N., Washington; George W. Melville, U. S. N., Washington; J. G. A. Meyer, New York; William L. Mintonye, U. S. N., Brooklyn; Thomas Mooney, New York; Charles D. Mosher, New York; Lewis Nixon, Philadelphia; John F. Pankhurst, Cleveland; Cecil H. Peabody, Boston; H. B. Roelker, New York; Horace See, New York; A. W. Stahl, U. S. N., San Francisco; Robert W. Steele, U. S. N., South Orange, N. J.; E. Platt, Stratton, New York; John G. Tawresey, U. S. N., Philadelphia; David W. Taylor, U. S. N., Washington; Stevenson Taylor, Hoboken; Philip R. Voorhees, New York; Benjamin H. Warren, Stamford, Conn.; Frederick M. Wheeler, New York; William C. Williamson, Philadelphia; Joseph J. Woodward, U. S. N., Newport News, Va.; W. H. Bailey, New York; Henry L. Gault, Philadelphia; Samuel D. Greene, New York; Rodman E. Griscom, Philadelphia; Frank W. Hibbs, U. S. N., Washington; Richard W. Meade, U. S. N., Washington; Frank E. Kirby, F. A. Kirby, C. B. Calder and Gilbert N. McMillan, Detroit; Jacob W. Mil-

ler, New York; A. P. Niblack, U. S. N., Washington; John Schouler, U. S. N., Washington; Aaron Vanderbilt, and Capt. Geo. L. Norton, New York.

The society was not long in beginning business. President Griscom, Secretary Capps and the other officers were re-elected for the ensuing year, as an indication of unanimous approval of their excellent services.

PRESIDENT GRISCOM'S OPENING ADDRESS.

President Griscom made only a few general remarks preliminary to the reading of the first paper. Practically all expenditures of the society during the past year were for printing. The society began its second year, Mr. Griscom said, with an addition of 51 new members and associates, making the membership at present consist of 450 members and associates, and 5 juniors, a total of 455. He referred to the Chinese-Japanese war and its surpassing interest to naval men and members of the society, but he regretted that information at present at hand, though sufficient to arouse some controversy as to the value of types of ships, can not be regarded as sufficient to form an opinion, or even to lead to serious question as to the relative advantages of battle-ships and cruisers.

"The increasing love for yachts and yachting, and especially the very great interest taken in the recent international yacht races, are sure indications," said Mr. Griscom, "of our natural love of the sea, and with the growth of this spirit must surely come the natural ambition to see the American flag flying upon American merchantmen in every harbor on the globe. But the full development of a naval force is not possible unless the growth of the merchant marine has kept pace with the naval development. A technical society of this kind has no raison d'etre if there are no ships to build, and, if its labors in a purely technical field result in reawakening general interest in the development of our great maritime resources, there will be little doubt that the inception and growth of a society of this kind is a national blessing."

Then followed Admiral Meade's paper, from which liberal extracts are here made:

SOME SUGGESTIONS OF PROFESSIONAL EXPERIENCE IN CONNECTION WITH THE NAVAL CONSTRUCTION OF THE LAST TEN YEARS—1884-1894.

Richard W. Meade, rear-admiral, U. S. N., associate member, gave some interesting reminiscences about the days of wooden ship building in the navy, and how he was ignored when he suggested even iron frames for wooden vessels in 1865. He added that he did not propose to pick flaws or to seriously find fault with recent construction or antagonize anybody in discussing the subject as given above, but that a free discussion now might aid in improving the construction of the next decade. He said that without a well matured scheme of naval construction and administration which shall harmonize with such policy, all labor is unsystematic, and much of it must be necessarily useless and vain. "This matter ought not to be," he says, "a question of politics, but of the honor of the nation. In this year of grace 1894 we have on our navy list, building or built, forty-two vessels that we call 'the new navy.' The several types compare favorably with type ships on the other side of the Atlantic, and some of our types are distinctively, we think, superior to those of similar class built in England. But while the naval construction of the past decade is in the main satisfactory, it is not, I think, entirely satisfactory to the majority of experienced commanders."

"If I had my way" he said "not a single cruiser beyond those already designed, building and built, should be added to the navy until at least twenty battle-ships, one hundred torpedo boats, and a suitable number of rams were in readiness for active service. The vessels that seem to be the least satisfactory to the practical men of our profession are the Columbia and Minneapolis and the Detroit class; the Cincinnati class, also, in a less degree, except for coast defence. And they are unsatisfactory for these reasons: The smaller vessels can not cruise in time of war except in home waters; and as to the larger ones, such as the Columbia, it is feared that vessels like the Majestic and Teutonic, for instance, may laugh at our three-screw racers, which cannot cross the ocean at the same speed these commercial greyhounds maintain year in and year out. Moreover, as to the question of fighting, I doubt very much the superiority of the Columbia over the American liner New York, the latter suitably armed as she would be in the service of the government; while, as to coal capacity, the New York or Paris of the American line are by far the superiors of the Minneapolis and Colnmbia, and already many thinking men believe that the third screw is nothing more than a very expensive experiment, which we will not be in a hurry to repeat. These high-speed commerce destroyers can as well be obtained from the merchant marine in time of war as from the navy; better, indeed, for the conditions are such that the merchant steamer is far more apt to be perfectly ready for her work when wanted. The question of mounting guns and furnishing ammunition is one of a few days only. We all remember the remarkable celerity with which a couple of fast merchant steamers were equipped recently for the service of Brazil in dealing with her insurrectionists."

Then the rear-admiral outlined a naval programme, which is as follows: "Though naval opinion varies considerably, it is, in the main, agreed upon to-day by naval men that an efficient fleet for modern warfare should be composed of the following integral parts: 1st. Armored ships for coast defence; (b) armored ships for harbor defence; (c) armored, cruisers; the battery and torpedo outfit being of the heaviest and most effective character possible, and all the vessels built with a view to ram when necessary.

"2d. Rams of great speed and handiness, partially protected by armor belts and armor bulkheads in wake of the engines and boilers, the battery to be merely nominal, the ram to be the chief weapon.

"3d. Torpedo vessels of at least three classes, A, B and C. Class A to be known as 'torpedo catchers,' or, as the French have it, 'Torpilleurs de haute mer.' The smaller classes, B and C for coast and harbor defence.

"4th. Cruisers of very great speed under steam and with a large capacity for coal and stores, giving a great radius of offensive action. I do not hesitate to say that these vessels should be drawn exclusively from the merchant marine, which vessels I should class as the '4th reserve.' The conditions of ordinary cruising in time of peace for vessels of the regular navy are such that these ocean greyhounds are of little or no use to the navy except in time of war. The short voyages and the long stay in port in time of peace, combined with the great cost of maintaining such expensive vessels in commission, are quite enough to demonstrate the strength of my argument.

"5th. Cruisers of moderate speed under steam, say 14 or 15 knots, rigged with three or four masts and fitted to carry large fore and aft sails as auxiliaries to steam, very useful in such waters as the Pacific, where long distances must be traversed and where coal is not only scarce, but very expensive. This class of vessels should, in my opinion, be of composite construction, transversely, of steel with longitudinal stringers, longitudinally planked and coppered. I do not think such ships need an inner skin of steel, though the larger ones might have it extending to the water line. This is a class of ships that the United States navy needs most at this time, and it seems passing strange the government has not even one in commission.

"6th. Gunboats of light draft, composite build, and limited rig for canvas, with fair speed under steam, say 11 knots, well armed with rapid fire guns and to draw not over 10 feet at the load line—such vessels are the pressing necessities of the hour. It is only necessary to refer to recent events in China and Central America to show how large sums of money could have been saved had our navy possessed some half a dozen such vessels. For service in shallow waters and rivers such vessels are invaluable as aids to the heavier vessels.

"7th. Store ships, harbor training ships, practice vessels, receiving ships, despatch vessels, bomb vessels, and tugs, both sea-going and harbor tugs. And, with a navy built up on the lines indicated, questions as to stagnation in promotion might not arise, I think.

"1st. With reference to the armor-clads for coast line defence, the consensus of naval opinion seems to be that ships of the original plan of the Indiana class, with some slight modifications, fulfill the conditions required. If any improvement is needed, it may be in the direction of less weight in hull, coal, and stores, and consequently less draft of water. For harbor defence, my own opinion is that there is nothing comparable to the single-turret monitor of moderate speed and light draft, carrying 12-inch guns. The qualities of the armored cruiser are well covered in the original design of the New York, with some slight modifications that experience has shown to be desirable. We do not need many of these ships; they are too expensive, and yet not of the line of battle. Of the second class battle-ships, the Maine is an excellent type and likely to prove much superior to the New York for hot work. The relative qualities of coast defence battle-ships should, I think, stand thus: 1st, seaworthiness; 2d, fighting power; 3d, steam speed; 4th, handiness; 5th, draft of water; 6th, stowage; 7th, sailing qualities (if any)—Of the armored cruisers: 1st, seaworthiness; 2d, steam speed; 3d, fighting power; 4th, handiness; 5th, stowage; 6th, draft of water; 7th, sailing qualities (if any)—Of the harbor defence vessels: 1st, fighting power; 2d, draft of water; 3d, handiness; 4th, steam speed; 5th, seaworthiness; 6th, stowage; 7th, sailing qualities (if any.)

"2d. As to the rams, the Katahdin is as yet unfinished and no opinion of any practical value can be offered in relation to her. The relative qualities of the ram (pure and simple) are, in my judgment, however, as follows: 1st, seaworthiness; 2d, steam speed; 3d, handiness; 4th, stowage; 5th, fighting power (as to guns); 6th, draft of water; 7th, sailing qualities (if any.) But every vessel in the navy may and ought to have a strong bow capable of being used as a ram if pressed hard and occasion serves. I think the straight bow cut away at the fore foot to reduce grip and insure greater handiness far preferable to the French eperon or spur which has latterly come so much into fashion. Experience has shown that in cases of actual collision, the vessel with the eperon has been nearly as severely damaged as the rammed adversary, while the straight American stem cuts like a cold chisel and comes out easily.

"3d. As to torpedo vessels, the Cushing and Ericcson are good types of classes B and C, but class A should be larger; certainly large enough to keep the sea in all ordinary conditions of weather, and maintain in smooth

water a high rate of speed. Vessels of the English Havock class are suggested as desirable. The navy should have not less than 100 torpedo boats, of which 75 should be of classes B and C. They need not all be in commission, and those out of commission at the various strategic points on the coast could be hauled out of water and kept painted, with machinery white-leaded and tallowed, ready to go into the water at forty-eight hours' notice.

"4th. Of the rapid type of cruisers for commerce destroyers, I know none that better fulfill my idea of what is needed than those magnificent ocean liners, the Lucania and Campania, with their 22 knots per hour, day in and day out, and in a lesser degree, our own New York, Paris, St. Louis and St. Paul, and the English Majestic and Teutonic. These ships are, in my judgment, the 'commerce destroyers' of the future. But the navy has no use for such ships in time of peace. And this suggests the wisdom on the part of congress of holding out to our patriotic American builders and ship-owners the very greatest inducements to maintain such ships on the ocean lines of travel. Such ships should be classed as the fourth reserve, and their armaments manufactured and kept ready to go on board the very moment the war-cloud is seen on the horizon. Forty-eight hours should be the maximum limit of time necessary to place guns and warlike stores on board. The relative qualities of these commerce destroyers should stand thus: 1st, seaworthiness; 2d, steam speed; 3d, stowage; 4th, handiness; fighting power; 6th, sailing qualities (limited rig); 7th, draft of water.

"5th. While such ships as the Baltimore, San Francisco, Charleston, and Philadelphia are a credit to their designers and builders, we have not as yet built any vessel which quite embodies my idea of the ordinary cruiser to perform the necessary drudgery of peace duty. When the Chicago shall have received her new engines and boilers (if they do not occupy more space than her present ones) she will approach more closely the idea of the ships we need in the larger class of cruisers. The relative qualities of this type of ships for all rates, I think, should be as follows: 1st; seaworthiness; 2d, steam speed; 3d, stowage; 4th, sailing qualities; 5th, handiness; 6th, fighting power; 7th, draft of water. The tonnage of the smaller class should be limited to 2,500 or 3,000 tons displacement.

"6th. The relative qualities desirable in the gunboat class are, in my judgment, 1st, seaworthiness; 2d, draft of water; 3d, handiness; 4th, steam speed; 5th, sailing qualities; 6th, stowage; 7th, fighting power. I venture the suggestion that, for foreign service especially, they be steel-framed vessels, planked with double thickness and coppered, in length not over 150 feet on L. W. line, with a displacement not to exceed 800 tons on a draft of 10 feet. Gunboats intended purely for service in home waters or near the vicinity of dry docks may be built of steel throughout, but such vessels should not be sent to do duty abroad. The Petrel is a good type of this class of steel gunboats for service in the north and south Atlantic squadrons. She is larger and has greater speed than the one I have indicated, but would not be as useful, under all conditions, as the composite gunboat.

"7th. As to the miscellaneous vessels that make up a naval establishment, the only ones that seem to call for special notice are the 'despatch vessels.' Now it certainly seems to me a mistake to build vessels of 1,500 tons displacement, such as the Dolphin, and call them 'despatch vessels.' They are in no sense despatch vessels in this rapid age; they can not run in heavy weather without slowing down; any sea reduces their speed very considerably; they are not large enough to do the work required. A despatch vessel should not be less than 3,000 tons displacement, and that is little enough."

He then added in support of the sentiment of Mr. Dickie's paper, the following: "And now to a broader question than all else. It is the duty of every patriotic American to assist in rebuilding and rehabilitating the American merchant marine, its increase to be side by side with the growth of the navy. Indeed, for my part, I am even more anxious to see our mercantile prosperity on the seas restored to what it was in the early fifties than to build cruisers for the navy, for, without a mercantile marine, we can not have a sufficient reserve of good seamen; and without good seamen, and their officers, ships and guns are of little use. Have we not seen some striking instances of this recently, in the war between Japan and China? China, with a fine fleet lacking a competent personnel; Japan with a navy much inferior to that of China, but with a personnel trained to latest knowledge in the art of war. And, if we are to have a policy, let us have one, for Heaven's sake, that will outlast the brief space of a presidential term. Our best policy is an exceedingly simple one. From all points of view, does it not seem to be the very essence of wisdom not only to build a proper navy, but to hurry the growth of our ocean commerce."

### DISCUSSION ATTENDING ADMIRAL MEADE'S PAPER.

Admiral Meade's paper, in which he so severely attacked the Minneapolis and Columbia, was the first on the programme. In the discussion that followed he was unable of course to meet the arguments of Engineer-in-chief Melville, Passed-Assistant Engineer McFarland and others who explained engineering questions to which the admiral had paid no attention in his comparison, for instance between the Minneapolis and Columbia and Atlantic express steamers like the Paris and New York. But Admiral Meade, although admitting that he was unable to discuss the engineering question, declared that the triple screw was an experiment, and created considerable interest by declaring that if he succeeds in getting his squadron together at any time in the near future he will have a series of full speed trials, unless he meets with direct orders to the contrary from the department. "I will have the trials first" he said "and report them afterward. I want to settle this question of Mr. Cramp giving us a vessel that makes 23 knots on trial and only 21 knots afterward. I will have the Columbia, with picked coal and everything else that goes to make fast time, waiting for the Teutonic or Majestic and order her to chase and catch one of them going out of New York harbor. Of course I may be prevented in this, but I have come to be an admiral after a great many years of service and I am going to have the speed trial if I can and report it afterward. Why do we never have orders for speed trials? We sailors in the navy can help the engineers a great deal in this way. I have in mind the view of giving the Columbia trials with one, two and three screws, to see what we can do in contradistinction to what Mr. Cramp can do."

This semi-serious talk from Admiral Meade was enjoyed by the engineers, but they did not allow his statements to go without answer. Commodore Melville, who had read the paper very carefully before the meeting said:

"I find that Admiral Meade has dropped into an error which is not at all uncommon amongst people who have made a hurried comparison between such ships as the Minneapolis and the Atlantic express steamers like the Campania. Nobody will deny that the Minneapolis would be a much better ship for us if she carried as much coal as the Campania does, but it requires very little investigation to show that this is a physical impossibility. From the description of the machinery of the Campania, recently published in the London Engineer, I find that her horse power is about 28,000, and that her coal consumption is 600 tons a day, although I have seen it elsewhere stated that it is as much as 646 tons. However, assuming that it is 600 tons, and that her bunker capacity is not greatly in excess of what would be necessary to make a run in very heavy weather, she should carry at least 4,000 tons of coal. If we gave the Minneapolis this much, the coal and machinery would take about 80 per cent. of the displacement of the ship, leaving less than 1,500 tons for hull, battery and equipment. It is needless to say that the Minneapolis could not carry such an amount of coal. I have made a fairly reliable estimate of the weight of the Campania's machinery, and making all possible allowances for her, I find that it cannot be less than 3,000 tons, and that it probably is nearer 3,500. This, with the amount of coal which she must carry in order to maintain her speed on her special service, makes the two factors of coal and machinery as large as the total displacement of the Minneapolis.

"I have prepared a table showing the relative sizes of the two vessels, their speed and bunker capacity and weight of machinery, from which it will be seen that the Minneapolis has about 23 per cent. of her displacement in coal, and the Campania 22 per cent., assuming that she carries only 4,000 tons.

"Were it possible to build a vessel of the displacement of the Minneapolis to run across the Atlantic at her speed, it is safe to say that the owners of the large transportation liners would not be building vessels more than twice as large to do the same work. The fact of the matter is that when you want high speed and great endurance with it, you must build big ships, much bigger ones than we have ever yet built for the navy. One other point connected with this is that of the space occupied by the machinery. In the Minneapolis, the boilers occupy 1⅓ cubic feet of space per I. H. P; in the Campania they occupy nearly 2 cubic feet, or practically 50 per cent. more than they do in the Minneapolis; in the engine room there is about the same or a greater ratio of space and power.

"While I am not prepared to controvert Admiral Meade's statements as to desirability of building such ships as the Minneapolis, it can not be denied that we have produced a remarkable vessel, in point of speed and endurance, on a comparatively small displacement.

| | Minneapolis. | Campania. |
|---|---|---|
| Length between perpendiculars | 411.6 | 600 |
| Beam | 58.19 | 65 |
| Draught | 22.5 | 27 |
| Displacement | 7,350. | 18,000 |
| I. H. P. | 21,000. | 28,000 |
| Speed | 23 | 23 |
| Coal in bunkers | 1,700. | 4,000 |
| Per cent. of displacement | 23 | 22 |
| Weighth of machinery | 2,000 t. | 3,000 t.* |

The discussion was also entered into by Naval Constructor Bowles, Mr. Kafer, Mr. Nixon, Col. Stevens, Mr. Miller, Passed-Assistant Engineer McFarland, Mr. Edwin Cramp and Mr. Horace See.

The next paper was that of Mon. E. Bertin on the "Use of Small Models for the Determination of Curves of Stability." This paper was not of the kind to create discussion, but the author was given a special vote of

*Approximate, but less than actual.

thanks for the preparation of it, on motion of Chief Constructor Hichborn of the navy, who expressed high appreciation of it and who was probably most capable among those of the meeting of judging of its value. Mr. Kafer superintendent of the Morgan Iron Works, took occasion immediately upon the conclusion of the readtng of the paper to say that he was not in favor of longitudinal bulkheads. The ultimate value of longitudinal bulkheads, he said, is not known, and he suggested that the models might well be used in making calculations in that direction.

An extended extract of the paper of Mr. George W. Dickie of the Union Iron Works, San Francisco, which was the next in order, follows:

SOME OBSTACLES TO SHIP BUILDING AND OWNING IN THIS COUNTRY.

Mr. Geo. W. Dickie's paper on the above subject, was suggested, he said, by Mr. W. W. Bates' paper read at the last meeting. The paper dealt for the most part with conditions on the Pacific coast, the writer having been engaged for 25 years in ship building and marine engineering at San Francisco, but conditions are not very different in other parts of the country. The following synopsis will give an idea of his argument.

"In order that the United States may participate in ocean commerce to the extent that her own imports and exports entitle her to, there must be, first, a patriotic ambition throughout the country to carry the products of our industry under our own flag to every country which cares to exchange products with us; second, wise national laws to protect and foster our merchant marine; third, state and municipal laws on the part of the sea-girt states and maritime cities encouraging ship-building and ship-owning within their own borders.

"At the time when the United States may be said to have had a large share of the ocean carrying trade of the world in proportion to her wealth, that wealth was largely confined to the states having a seaboard on the Atlantic, and accumulated wealth naturally sought investment in ocean commerce. With the interior development of the vast country lying between the Atlantic and Pacific came that vast net-work of railroads, which not only absorbed all the capital of the older states, but raised a mountain of debt, largely due to foreign capitalists, that is to-day sapping the financial life of the country. The overshadowing power of the aggregation of capital represented by the great railroad corporations, the rapidity and ease with which large fortunes have been made in the manipulation of these great interests, have drawn men's minds away from the more sober business of ocean transportation. As the people engaged in the industries of this country recover from the overdose of railroad from which they have been sufferiug during the past twenty years, the great natural highway of the nations will receive attention, and our Atlantic seaboard will wake up with her old love of the sea strong as ever, and the Pacific slope will find more wealth in the Pacific than has ever been dug from the Sierras. The British government never permits an opportunity for cultivating a healthy sentiment on the part of the general public in regard to naval matters to pass by unimproved. Maritime exhibitions are fostered at her principal sea-ports. Naval manœuvers are carried out along her whole coast. Launches and trials are made semi-public functions. All the traditions of the past glories of the naval and mercantile fleets of England are made part of the education of the youth. No matter what the programme may be for increasing the British navy, the country responds heartily. At the launch of the battle-ship Oregon in San Francisco no government ship was there to represent the navy. Not a gun was heard to herald the event. The builders to make a decent show had to go around and beg the English merchant ships to dress up in their best bunting, which they did to the delight of the natives, who did not seem to realize the true meaning of such a display.

"This brings us to our second requirement, that of wise national laws to protect and foster our merchant marine. Several acts of congress have been passed having for their object the revival of American ship-owning and ship-building, but, so far, they appear to have failed in accomplishing any satisfactory results. Quite a large number of those interested in shipping matters claim that, as foreign commerce can only be prosecuted in direct competition with all the world, American ships, built of protected material, and with protected labor, represent an invested capital so far in excess of their competitors that, even with other thing equal, the contest is too one-sided for any hope of success. We are very apt to condemn such a presentation of the subject as unpatriotic, but it is business truth. We must either build ships for the ship-owner at the same price as that paid for a similar ship with which he competes, or else give him the privilege of buying his ship where his competitor buys his, to make the struggle an equal one; and as, with material and labor at present rates, it is impossible to meet the European price for a merchant ship, and it being the will of the people that ship-building should have a like protection with engine-building or bridge-building, the free purchase of ships abroad would be as unjust to the ship-builder, as the free purchase of engines would be to the engine-builder. It follows, therefore, that if there be a strong sentiment throughout the country in favor of a revival of American ocean commerce, the American ship-owner should, from the public purse, be placed on an equal footing with his foreign competitor. This being purely a matter of national business competition, our law-makers at Washington should see to it that no merchant-shipping act of parliament places the British ship-owner in such a favorable position but that a merchant-shipping act of congress will do a little better for the American ship-owner, even if it does cost a little to do so. Public moneys thus spent would be but a small commission on the trade thus secured for the country.

"There is a grand opportunity for the establishment of a great American steamship line between San Francisco and New York, via the straits, taking in the principal seaports of South America. We believe that a bnsiness could be built up to admit of two steamers per month having a general freight capacity of 6,000 tons each. These vessels should have speed enough to insure 65-day trips, and should have first class passenger accomodations for a limited number of cabin passengers between way ports. They should be designed so that in case of need the government could use them for cruiser transports. They might also be partly or altogether manned by a naval reserve force. Such a line would eventually give us South America for a customer, and the government aid in the form of a mail subsidy or a mileage rate would be as nothing compared to the benefits that would result to the trade of the country.

"The third help that is needed to foster ship-building and ship-owning should come from the state and municipal legislation. The laws relating to floating property differ in the various seaboard states, and statements that apply to any one state cannot apply to another. If we consider the question of taxation, the constitution of California provides that all property, real or personal, found within the state on a certain date of each year must be taxed on its actual value at the time. While ship property may not be actually within the state, the evidence of its ownership being found in the custom-house, it is taxed accordingly. For instance, a vessel owned and registered in San Francisco and valued at, say $200,000 has to pay the same city, county, and state taxes as a building on Market street valued at the same amount. Apart from the crushing load thus imposed upon the ship-owner, there is the manifest injustice of such a method of taxation. The vessel thus taxed can receive no benefit whatever from the expenditure of the taxes that so materially reduce her money-earning capacity, while other property receives the full benefit that can be derived from the public service. Police service is provided for the city property. The vessel is beyond such protection, and must take care of herself as far as state or city is concerned. The city property has street lights provided in the darkness. The ship property in the midnight storm is not sailing through a street with electric lights on either side to show the way. An expensive fire department is maintained by the taxes to save the city property from destruction by fire. A vessel finds fire in the cargo; but there is no fire alarm to turn out the fire department in her case. Her own resourses must be depended upon to save her. In fact, no part whatever of the tax, which amounts to over two per cent. per annum of the value of a vessel owned in San Francisco, is expended for the benefit of the property thus taxed. Worse than that, when she lies at the wharves of the city which is governed and adorned by the expenditure of the tax levied upon her market value, she must, in addition to it all, pay the same rate per day wharfage as the foreign vessel that lies next to her, and which is subject to no such burden. Now the wharf is to the ship what the street is to the building. What a howl would be raised by the owner of this building if, after he had paid the taxes that build and maintain the streets, he were not permitted to open his door and come out on the street or move any goods from his building without paying ten or twelve dollars per day for streetage. And yet the case would be similar to that of a city-owned ship at one of the city wharves."

DISCUSSION ON MR. DICKIE'S PAPER.

Mr. F. B. King, marine department, Maryland Steel Company, had hoped that Mr. Dickie, who was not present—his paper having been read by Secretary Capps—would refer to costs attending ship building here and in other countries, especially Great Britain. We have now reached costs in material approximating British costs, Mr King said, and in piece-work we have actually brought labor to the British standard in a few cases, but our difficulty is not so much from material and labor costs as from the fact that we build so few vessels. Spasmodic building causes idleness for long periods, and extensive plants with high-priced naval architects, draftsmen and other skilled workmen must be supported. On account of conditions ruling in yards where all kinds of vessels must be built and where orders are few and far between, it is impossible to take full advantage of the piece-work system.

Mr. L. H. McMutrie of Sparrow's Point also laid great stress on the importance of adopting the piece-work system in ship yards generally in this country, but when he said that the matter of a revival in American ship building was not so much a national question at Washington as a business question in the ship yard, Mr. Edwin Cramp arose to take exception to such a point being made. Piece-work would be a great advantage Mr. Cramp said, but we can not apply it to anything like its full advantage here. In England and Scotland ship building is carried on in such an extensive way that certain builders are known for the type of ship they build, and in building vessels of one type builders are enabled to apply the piece-work plan to its full worth. Builders of certain types of machinery

here—locomotives for instance—have the same advantage in their specialties and can compete with the world Encourage ship owning in this country, he said, and the labor question will be settled in the ship yard. If protection is good for manufacturers ashore it is also good for the ships afloat.

Then followed a comprehensive paper by Mr. S. Dana Greene, manager of the General Electric Company, on "Electricity on Shipboard—Its Present Position and Future Development." Mr. Greene explained the installing of a marine electric plant, the wiring of the vessel, use of electric motors for ammunition hoists and pumps for handling turrets and the guns inside them, for closing water-tight doors and for other uses. He went into considerable detail regarding search lights, range finders, signaling and firing circuits, electric logs and steering compasses, and the rapid means of communication by indicators and telephones on board ship. The paper was illustrated with cuts of all sorts of electric appliances, and was highly commended for the exhaustive manner in which the subject was treated, but as it was largely a summary of facts about the use of electricity on shipboard, not much comment was brought out with reference to it.

President Jacob W. Miller of the Providence and Stonington Steamship line was prompted by Mr. Green's reference to the use of search lights aboard ship to give his company's experience with the search light in fog on Long Island sound. First in placing the search light forward, he said, they found that it was a great disadvantage, as it tended to blind the pilot. When placed farther aft, there was not so much difficulty from this cause but the light was of more benefit in fog in enabling an approaching ship to keep out of the way of the vessel equipped with the search light than in aiding the officers of the latter to see through the fog. The dim area of light from the ship equipped with the search lamp was a warning to other vessels in fog. This was the best feature of its use. In application to fog signals, electricity had also been used advantageously, he said on the Sound. By an automatic arrangement of fog signals, the intervals between signals were so arranged as to enable one vessel to know another of the same fleet. Then, too, by a connection between the whistle and the search light, blasts of the whistle were blown at certain intervals and at the same time the light was thrown at an angle of 45 degrees into the air, thus securing the advantage of both sight and hearing.

Naval Construator Baxter referred to the thoroughness of Mr. Greene's paper and its value as a collection of facts covering the use of electricity on shipboard up to this time, and Mr. J. F. Halloway, who was for a great number of years at the head of the old Cuyahoga Works in Cleveland, and who was seated beside Mr. J. F. Pankhurst of the Globe Iron Works Company, explained the arrangement of the Chase automatic fog whistle which was in use on the lakes long before electricity was thought of in this connection.

Anyone interested in any way in the use of electricity on ships will find valuable reading in Mr. Greene's paper.

The paper on "Cellulose and Its application to War Ships," read by Mon. E. Cheneau, was of course interesting only to the naval men. The author had devoted a considerable part of his paper to showing that there was no danger of decomposition or from insects in storing cellulose aboard ships, and in this he was supported by Constructors Bowles, Nixon, Fernald and Stahl, all of whom were very firmly of the belief that cellulose having been adopted for any of our war ships, it should be put aboard immediately and not kept ashore. The question of its value was not raised in the discusion. Constructor Bowles spoke highly of the tests at Norfolk navy yard.

At this point in the proceedings, Admiral Meade, who had occupied the chair during the afternoon session on Thursday, called upon Charles H. Loring, ex-engineer-in-chief of the navy, to relieve him, as he desired to take part in the discussion attending Commodore Melville's paper on the "United States Triple-Screw Cruisers Columbia and Minneapolis." This announcement from Admiral Meade caused another riffle of laughter and whispered comment throughout the room, as it was expected that there would be a renewal of the very interesting discussion of the morning, when the admiral's paper attacking the new cruisers was read. Messrs. Charles H. and Edwin Cramp were both present, and there were enough distinguished officers in the gathering to bring out an old-time line and staff fight. Commodore Melville read the greater part of his paper in a very clear and interesting manner, but before finishing his throat gave out and he was compelled to leave a part of it unread. The paper had, however, been quite generally studied in advance by most of the members. Commodore Melville's paper follows:

### GREATER ENGINE POWERS AND NOT CHANGE OF SHIP DESIGNS MUST BE APPLIED TO FAST ATLANTIC LINERS OF THE FUTURE— COMMODORE MELVILLE'S INTERESTING DISCOURSE ON TRIPLE SCREWS.

In making extended extracts from the paper of Commodore George W. Melville on the "United States Triple-Screw Cruisers Columbia and Minneapolis," it may not be out of place to quote first the concluding remarks of the engineer-in-chief.

"It would be a natural supposition," he says, "that having built the two fastest cruisers in the world for our navy, every naval officer would rejoice at their possession and be proud of them. I regret to learn, however, that we are in a mild way repeating the experience of the Wampanoag, which, as some of you may remember, was declared a failure by a board of naval officers, although she was far and away the fastest vessel in the world, being several knots faster than anything else afloat, and as some believe an important factor in the settlement of the Alabama claims at Geneva. Now, the cry is raised that, although we have the fastest ships, they can't carry coal enough to go across the ocean at full speed. In fact, some say that we don't want such fast ships, and some, echoing the jealous wails of a few of our transatlantic friends, have actually talked about the ships being failures! It seems very hard to satisfy our critics. Before we began the building of our new navy, it was constantly hurled in our teeth that we were behind the times, that we couldn't build as good ships as they did abroad and so on to the end of the chapter. Now we have beaten our foreign friends, and we are told that fast ships are useless. It seems to me that the idea so cleverly put by my friend Nixon of Cramps' in regard to battle ships is equally true of fast cruisers. Explaining why we should not rely on monitors alone he said: 'You can't get as much fight out of two million dollars as out of five.' So it is with these fast cruisers. We don't want our navy to consist of them alone, and, as I said here last year, I believe for mere peace cruisers, we have over-speeded many of our ships; but in time of war I believe there is a great field for just such ships as our triple-screw cruisers, the fastest vessels now afloat."

In an appendix to his paper Commodore Melville gives the dimensions of hull and machinery of the Columbia and Minneapolis, together with the data of their performances on trial, but it is not necessary to repeat any part of it here.

"Although I had the honor of recommending the use of triple screws on these vessels," says Commodore Melville, "it is hardly necessary to tell this society that the use of triple screws was not a novelty, and that any credit in the matter arises simply from their use for machinery of much greater power than had previously been attempted, and for persisting in the design against the advice of some of my best friends in the profession, who believe it too much of an experiment. When I was asked to design machinery of about 21,000 I. H. P., for the Columbia, there were a number of questions which came up for consideration. One was that of securing economy at moderate speeds when full speed was so high, and another was that of the shafting. When the design was under consideration, no steel shaft had yet been made in this country for the transmission of as great a power as 10,000 horses, and while I had every confidence in my friend John Fritz of the Bethlehem Iron Company, I felt that it would be safer to adopt a design which would give us smaller shafting. The alternative to triple screws was twin screws either with one very large engine or two smaller ones on each shaft. The former meant large parts of the machinery all through and the latter great multiplication of parts.

"The French experiments on the Carpe and the trials of the Tripoli had demonstrated that there was no doubt of the practical success of triple screws, and the preliminary design of the Dupuy De Lome with triple screws showed that the French were satisfied with Carpe experiments. I believe also that we would find it more economical to run one engine of a size for 7,000 I. H. P. at about 2,000, than to run two 10,500 I. H. P. engines, or even two 5,000 I. H. P. engines, even if it did involve dragging the idle screws, allowed to revolve freely. I had hoped to be able to give some figures on this point, as an attempt was made during the return trip of the Minneapolis from her official trial to secure a comparison of the horse power and coal consumption when making the same speed with one, two and all three screws, but fog and other circumstances interfered, and the speed had to be determined by the patent log, so that the results obtained can not be considered as at all conclusive. The Columbia is now on active service, and by our next meeting I may be able to give reliable data as the averages of considerable periods. It is, however, obvious that, even if the drag of two idle screws should require enough additional power to make the actual cost of propelling the vessel at a given speed in pounds of coal per hour nearly as great as the similar cost of driving her by the after engines of twin screws with a pair on each shaft, there is a gain in economy of maintenance and in convenience. We have been compelled in the New York and Brooklyn to make special provision for the wearing down of the shaft bearing of the after engine, and, in the Blake of the English navy, where the attempt has been made to avoid this difficulty by using the forward and after engines on each shaft alternately it is necessary to disconnect all the connecting rods and eccentric straps, which is certainly inconvenient and involves considerable delay when it is desired to use both engines for higher powers.

"When the Columbia and Minneapolis were designed, we hoped to secure a speed of about 22 knots for the maximum I. H. P. of 21,000, and while some enthusiasts predicted higher speeds, those of us who were more conservative felt that 22 knots was about all we could reasonably expect. The news that the Columbia had made 22.8 knots was, therefore, both gratifying and astonishing when the official report showed that it

had been made for only about 18,500 I. H. P. This seemed so remarkable that I urged the trial board to go over the computation of the horse power again with great care, which was done without the detection of any error. When the complete data were received, I had one of my most capable assistants, an expert in these matters, revise all the work, but he could detect no error anywhere. After this performance, it was, of course, reasonable to expect still better results from the Minneapolis, if she should develop the full 21,000 I. H. P., and, as you know, such was the case, an average speed of 23.07 knots being secured, making her the fastest large vessel in the world, and, for the length of her trial, the fastest vessel, large or small.

"As already remarked, the economy of propulsion in the case of the Columbia was so marked as to suggest comparison with other fast vessels, and it was at once apparent that the gain in economy was considerable. A natural comparison is with the New York and the Olympia, and I have brought the New York and the Minneapolis to the displacement of the Olympia by Froude's law. As the vessels are all of considerable size, the error due to not calculating the frictional resistance separately is negligible. Inasmuch as the speeds thus found are not all the same and it is desirable to make the comparison at the same speed, I have calculated the exponential relation of speed and power from a curve for a 5,000-ton vessel constructed by Froude's law from the progressive trials of another ship where speed and power were determined with unusual care."

Here follows tables of scientific calculations along the lines suggested in the foregoing paragraph showing a gain in economy of propulsion of triple screws in the Minneapolis, against twin screws in the New York and Olympia, amounting to 11.9 per cent. over the former and 21 per cent. over the latter.

"When such a gain is shown," Commodore Melville says, "the most natural thing is to search for the cause, and here we are met with obstacles at the very start. Probably, after some consideration, the first suggestion would be that the center screw is very favorably placed for securing whatever benefit there may be from working in the forward current of the frictional wake. This would doubtless be accepted but for the fact that most of the authorities on screw propulsious have stated that, while the screw itself would be helped, any gain in this direction would be offset by the increased resistance of the vessel due to the action of the screw interfering with the stream line action. It should be said, however, that most of the authorities simply state this as a proposition without attempting any demonstration or quoting experimental data to confirm the statement. I am inclined to believe that this statement has been based on Froude's classic experiments on the Greyhound, and it is hardly necessary to remind this society that, while the experiments themselves were admirable in every way, the Greyhound had a very poor model compared with modern steamers and her machinery also was much different from that we now use. As a result, the data of the Greyhound experiments are of very little use as a guide for modern hulls and machinery. For example, Froude gave as a result of his experiments that the effective horse power, or power actually applied to overcome the resistance of the hull, was only from 37 to 40 per cent of the indicated horse power of the engines. About ten years or so ago, the late Mr. Wm. Denny quoted a case where a comparison of the indicated horse power with the effective horse power as determined by model experiments made by the younger Froude had shown the ratio to have risen to 60 per cent, and some calculations that I have made for some of our new ships has shown the ratio to be, in some cases, nearly 75 per cent. I feel, therefore, that we should not let our admiration for Mr. Froude's great reputation lead to the unqualified acceptance of statements based on his experiments on the Greyhound. Another objection also comes from the fact that there has gradually grown up a belief that propulsion by twin screws is more economical than by a single screw. This belief, I think, is based to a great extent on the admirable paper read by my friend Dr. White, the director of naval construction of the British navy, before the Institution of Naval Architects in April, 1878, where he showed that a comparison of some single and twin screw ships of the British navy indicated a decided economy in propulsion by twin screws. I refer to Dr. White's article, simply to call attention to the fact that a part of the reason for the increased economy of twin screws may have been due to their smaller diameter and greater helicoidal area. It will be observed from data which he presents that the slip of the single screws is very much greater than of the twin screws, and by calculating the indicated thrust per square foot of helicoidal area, it will be found that it is nearly twice as great for the single screws as for the twins. We are accustomed to allowing more indicated thrust for small quick running propellers than for large slow-moving ones, but here the conditions are reversed. It is to be noted also that the speed of tips of the single screws is about 17 per cent greater than of the twins, which would make the resistance per square foot nearly 40 per cent greater.

"Whatever may have been the cause of the marked superiority of the twin-screw ships over those with single screws, it is to be noted that there are numerous instances of single screw ships in which the I. H. P. per square foot of wetted surface is less than for the war vessels quoted by Dr. White. For example, the S. S. Charles V, built by Messrs. A. & J. Inglis, has an immersed surface of about 15,180 square feet. She is 323 feet on L. W. L., by 33 feet 9 inches beam, and on trial had a mean draught of 14 feet 10 inches, giving a displacement of 2,478 tons. At 14 knots, the I. H. P, was 1,575, or 0.104 I. H. P. per square foot of wetted surface. Another vessel, the Rotomahana, has 13,650 square feet of wetted surface, and is 285 feet by 35 feet 2 inches by 15 feet 7¾ inches, displacing 2,543 tons. At 14 knots the I. H. P. is 1,925 or 0.141 per square foot of wetted surface. It may be objected that these vessels are much smaller than the war vessels, and also that the ratio of wetted surface to displacement is higher, thus giving a larger divisor. Data are available, however, of the performances of some larger merchant ships. Thus the Umbria and Etruria have 43,980 square feet of wetted surface, 13,300 tons displacement, and are 500 feet by 57 feet 6 inches by 26 feet 6 inches. At 14 knots the I. H P. per square foot of wetted surface is 0.121. In the case of the Oregon, the ratio was 0.118; in the Servia, 0.119; and in the Gallia. 0.127. These cases all go to show that, so far as a comparison based on I. H. P. per square foot of wetted surface is concerned, the single screw vessels made an even better showing than those with twin screws whose performances have been quoted. The New York and the Olympia, however, make a better showing than the older twin-screw vessels, giving, at 14 knots, the New York 0.115 I. H. P., and the Olympia 0.146 I. H. P. per square foot of wetted surface, or about the same as the single screw merchantmen.

"The facts thus stated would seem to leave it at least an open question whether the increased economy of the triple screws is not due to the center screw working in the wake, but there are others which make it seem the probable solution. When the Columbia was designed there was a general belief that the race from the side screws would cause the center screw to work in water having a sternward motion, and it was the intention to give it about ten per cent. more pitch than the side screws. However, before the Columbia was tried, it was learned that the trials of the Kaiserin Augusta, the German triple-screw vessel, had shown that, if given such an increase of pitch, the center screw could not work up to the designed number of revolutions. When the Columbia was tried, all the screws were given the same pitch, 21 feet 6 inches, but the center screw ran some five revolutions per minute slower than the side screws, and the mean effective pressure of its engine reduced to the low pressure cylinder was nearly three pounds more than one of the side screws. In the case of the Minneapolis, the pitch of the center screw was set at 6 inches less than that of the side screws (21 feet 6 inches and 22 feet), and ran about one revolution faster than they with an aggregate mean effective pressure greater by three pounds and nearly 700 more I. H. P. Now, clearly, this can only be explained by assuming that the forward wake exerts a very strong pressure, and as we have the undoubted facts of the high speed and moderate horse power, the action of the screw can not have interfered with the steam line action enough to increase the resistance of the ship.

"Thus, it seems to me that the most reasonable explanation of the increased economy of propulsion is that in an unusual degree the center screw, which occupies the same position as the propeller in single-screw vessels, profits by the forward motion of the frictional wake, and this without interfering with the stream line motion sufficiently to increase the vessel's resistance. In comparisons such as we have been making a very important matter must not be overlooked—the standardization of the indicators and the correction of the mean pressures for the errors found. Since the trial of the Yorktown in February, 1889, the first case in which the indicator errors were considered, nearly a thousand tests of indicators have been made and reported to the bureau of which I am chief, and we have found that indicators submitted as first class have in many cases shown errors so great that allowance for them would reduce the mean pressure as much as 10 per cent. Until recently it was assumed that the indicators were correct, so that it may have happened that differences in horse power on which serious arguments were based were not real but due to one set of indicator springs having a very large error.

"As has been stated, it was not anticipated, when triple screws were adopted, that their use would give any increase or economy of propulsion, their adoption being due mainly to constructive reasons, and incidently to secure economy at cruising speeds. It appears now, however, that this method does give an increase of economy at maximum powers. It would seem, therefore, that for very high speed ships this arrangement would recommend itself, and, if it were not dangerous to prophesy, I should be prepared to anticipate the adoption of triple screws for all the new 'flyers' that enter for the transatlantic race. In this connection the closing remarks of Dr. White in the paper already referred to are highly interesting, and it would seem that by substituting triple for twin screws, his remarks would apply now. They are as follows: 'Looking to the future of steam navigation, one thing seems certain—greater speeds will be obtained than are now reached. It does not seem probable that any considerable increase in fineness of form, or in the ratio of length to breadth, will be adopted in future ships for the purpose of diminishing their resistance. Any increase in the load-draughts is also clearly

inadmissable. The greater engine powers which will probably be used in swifter ships will consequently have to be applied on a limited draught of water: and hence it may be anticipated that at no very distant date the designs of swift mail steamers will be subject to conditions resembling those sketched above for the Iris. The extreme draught will not permit a use of the single screw with a disc area bearing anything like the ordinary ratio to the indicated horse power; and it will become necessary either to depart from established precedents in the ratio of pitch to diameter of single screws, to adopt twin screws, or to accept greater speeds of pistons and propellors than are now common in large marine engines. At the present moment there is no great urgency in deciding between these rival methods, and I have no wish to attempt a prediction as to the practice of the future. The matter is, however, one well deserving the careful consideration of marine engineers and naval architects.'"

ENGINEERS MAKE SHORT ANSWER TO THE ADMIRAL.

As had been expected, Admiral Meade repeated his criticisms of the triple-screw ships, and it was at this point that he announced his intention of sending the Columbia in pursuit of one of the Atlantic liners as soon as an opportunity presented itself, risking approval or disapproval from the department after the thing was done. But whether it was that the engineers and the Messrs. Cramp did not think his argument germane to the discussion, or whatever the cause may have been, the admiral's statements at this time were allowed to pass almost without answer. Passed-Assistant Engineer McFarland, who had declared during the morning that the speed of the Columbia and Minneapolis for distances equal to that covered by the Atlantic express steamers on their best spurts, was by far the greater, contented himself by saying to Admiral Meade that the idea of triple screws had the support of Constructor Wilson and all the construction officers of the navy. Mr. Holloway said that it seemed to be generally admitted that the third screw increased efficiency. As he understood the conclusion reached by Commodore Melville, the increase of economy and speed was due to the efficiency of the third screw in the center. Contrary to expectations, the discussion was not prolonged, the day's session being concluded with a few conciliatory remarks by Constructor Bowles.

At the first session on Friday President Griscom was again in the chair, and the first paper read was that of Professor Cecil H. Peabody and Assistant Professor E. F. Miller, Massachusetts Institute of Technology, on "A Dynamic Steam Engine Indicator Tester." This paper was a technical description of a machine for testing steam engine indicators by direct comparison with mercury columns, which has been for nearly a year in use at the institute. The machine has the peculiar feature that an indicator undergoing tests describes diagrams similar to those taken from a steam engine, so that the errors revealed may be attributed to the indicator in actual service. Although regarded as a very valuable contribution to the literature brought out at the meeting, this paper was not of the kind to admit of extended discussion, and it was passed with a few inquiries and a vote of thanks to the contributors.

CARE AND PRESERVATION OF SHIPS.

Accompanying the paper of Chief Constructor Philip Hichborn, U. S. N., on "Experience Gained with Our New Steel Ships as Regards Care and Preservation," is a table giving dimensions of United States government dry docks and illustrations from plans of all of the docks. A few pages of the paper are devoted to experience in the navy with anti-corosive materials, used on the inside of the ship; to the matter of accessibility to the different parts in designing; to ventilation and sweating. To absolutely prevent sweating under all conditions is impossible, the chief says. The worst conditions as regards sweating are when the air becomes suddenly warmer, and at the same time is very damp, as during warm rains. While a non-conducting coating of cork, as used, gives fairly satisfactory results, it would be very desirable to have some composition which is a good non-conductor and could be readily applied with a brush thick enough to prevent sweating as well as the cork now used. Ordinary paint is far too good a conductor to do this. With proper care and renewal of brasses at reasonable intervals, auxiliary machinery, such as windlasses, hoisting engines, etc., will not, Mr. Hichborn says, give trouble.

As regards the care of the outside of the ship below the water line, the chief's position in favor of sheathing with wood and copper is well known. He has advocated sheathing for a long time past, and in this paper he goes into all of the details of the subject.

Referring to the dock question, he says: "Nothing has been more clearly brought out by our experience with the new naval vessels than the fact that ample docking facilities are absolutely necessary if the ships are to be kept in efficient condition. The docks we now possess at the navy yards and stations are barely adequate to the peace needs of our present navy. In time of war we should be very seriously embarrassed. Plans of docks accompanying this paper show that into the present completed docks our four most powerful battleships, the Indiana, Massachusetts, Oregon and Iowa, can not enter without lightening them considerably. Fortunately the Port Royal dock, which is larger, is very near completion. No private dock in the United States will take them, and in fact, the Halifax graving dock will be the only dock in either North or South America, except the three government docks under construction, which will accommodate these, our largest vessels."

Admiral Meade joined the chief constructor in recommending sheathing with wood and copper and more frequent docking. He directed attention to the care, required with modern ships as against ships of the past, and commended the paper in general. In connection with Constructor Hichborn's reference to the need of having some composition which is a good non-conductor, other than the cork now used to prevent sweating, it was suggested by one of the members of the society that aluminum could probably be advantageously applied in this direction.

FACE-HARDENED ARMOR.

Illness prevented the attendance of Captain W. T. Sampson, chief of the navy bureau of ordnance, and his paper on "The Present Status of Face-Hardened Armor" was read by Secretary Capps. "The greatest objection to the face-hardening or Harvey process, and one which seems least likely to be overcome in the immediate future," says Capt. Sampson, is its cost. The difficulties of the mannfacturer, although reduced by skill and experience to the minimum, are likely to remain permanent." He also says that there is nothing in the present application of the Harvey process, nor its future possibilities, to indicate the disuse of nickel in armor; rather that by increasing its percentage the toughness of the foundation plate and its resistance as a whole may be increased. The paper contains a table showing the number, curvature and thickness of Harveyed plates now manufactured for the United States navy and an appendix giving in detail results of trials of experimental Harveyed plates in the United States. "Whatever conclusion is reached, the fact remains," Capt. Sampson says, finally, "that Harveying in its present state has increased the resistance of armor fully 35 per cent. and perhaps 50 per cent., according to the thickness of the plate. It has also brought about a great improvement in the quality of our projectiles, and in doing so has perhaps lost some advantage it held over them at first, when subjected to direct impact."

In the absence of the author of this paper, and also on account of the limited number of ordnance men present, the discussion was not of importance.

HYDRAULIC POWER FOR WAR VESSELS.

Albert W. Stahl is a naval constructor who has superintended the construction of vessels on the Pacific coast. Alike to Mr. George W. Dickie of the Union Iron Works, San Francisco, he is an enthusiastic advocate of the use of hydraulic power for auxiliary machinery aboard war ships, and his paper devoted to that subject was an exhaustive plea to the navy department to carry out a comprehensive general scheme of hydraulic power in one of our new vessels. Constructor Stahl is a young man who proved quite capable of discussing the various subjects pertaining to different branches of naval architecture, but his broad scheme of hydraulic power found no supporters among the engineers in attendanee at the meeting, and was vigorously attacked on general principles by Mr. Edwin Cramp and Mr. William C. Williamson of Williamson, Bros., Philadelphia, manufacturers of auxiliary machinery for ships.

In his paper Mr. Stahl sketched the main features of a comprehensive system for actuating by hydraulic power all the auxiliary machinery not directly connected with the running of the main engines, and indicated the special hydraulic motors which, in his judgment, seem best adapted to the several operations to be performed. His argument in favor of such a scheme was based on the present complication of steam piping and the serious objections to the presence of such pipes outside of the engine and boiler rooms. He claimed that the partial installations of hydraulic power on the Olympia and Oregon were highly satisfactory, and said there was reason to expect similar success in further extensions of the system.

He proposed having one general central pumping plant, from which would be delivered the necessary quantity of water at one and the same pressure (except so far as it might be reduced by fluid friction in the pipes) to all the various motors, the latter being of such types as might be found most suitable to the several operations to be performed. He would have windlasses, steering gear, dynamos and turrets all operated by hydraulic power, and the paper took into account the author's detailed ideas of the production of the power in the central pumping station, the storage of sufficient power to meet certain demands, the transmission of the power to the motors, and the motors themselves. Although Mr. Stahl did not claim that he was presenting a new idea, his paper was listened to with a great deal of interest, largely on account of its novelty and from the fact also that it showed an earnest and elaborate study of the subject. He was of the opinion that compressed air has many advantages over steam, notably in the absence of heat, in dispensing with exhaust pipes, and in the additional ventilation of the ship by the air discharged from the various engines. But the air engines are practically as complex as the steam engines they are intended to displace, he said, and they require more, rather than less, skilled care and attention.

But Mr. Stahl's critics were not merciful on account of his evident sacrifice of time and labor in preparing a paper that should at least have proved interesting to even the practical men who opposed his idea. Mr.

Edwin Cramp was emphatic in declaring that there was no question of higher first cost, increased weight and additional expense of maintenance all being settled disadvantages in hydraulic installation, as against steam, to say nothing of the great objection to hydraulic power in cold climates. We have had no trouble in the east with bursting steam pipes or the other objections raised by Mr. Stahl" he said "but they have had plenty of difficulty with hydraulic machinery in the boats on the Pacific."

Mr. Williamson said that hydraulic machinery aboard ships had been given sufficient trial to demonstrate, very clearly, its many great disadvantages. He knew of only one ship running into the port of New York that was equipped with hydraulic gear. He cited instances where his firm had replaced such machinery only recently with steam appliances. More skilled labor and care was certainly required for the hydraulic gear, and another serious objection to it is rankness in steering. There was a probability of elictricity being more generally substituted for steam but not hydraulic power. His firm is putting electric ash hoists into the new American line ships for the Cramps, and he thinks that other auxiliary machinery may also be worked by electricity before long.

Mr. Stahl, concluding the discussion, said that in writing the paper he had no thought of urging the adoption of hydraulic power for auxiliary machinery of merchant ships. There was no question of certain advantages of steam and electricity in merchant vessels.. "But if we take up the subject of electricity on war ships" he said " this thing of touching a button and depending upon automatic devices, in which it is extremely difficult to locate causes of break-downs, is not what is wanted in a fight. We are not depending enough on the human machine. A reliable gear that can be depended upon is what is wanted in a fight. " As to the charge of rankness in steering made against the hydraulic gear, he was ready to state that as for beauty of conception, and rapidity and accuracy of action, there was nothing afloat to equal the gear of the Olympia.

### CONCLUDING SESSION—NOTES ON LAUNCHING.

Admiral Meade again presided at the opening of the afternoon session on Friday, but upon the conclusion of discussion attending the first paper, that of Naval Constructor Wm. J. Baxter on launching, he invited Chief Naval Constructor Philip Hichborn, who is also a vice president of the society, to the chair. Mr. Baxter is the naval constructor in charge at the Norfolk navy yard, and his " Notes on Launching " was a paper giving the practical details of the launching at that yard of the Raleigh, a twin-screw cruiser of 300 feet on load water line and of very fine lines, and the Texas, a twin-screw second-class battle ship with fine ends and broad beam. The vessels were built on parallel stone slips 325 feet apart, perpendicular to a granite quay wall. The river, at the point where the vessels are built, is about 600 feet wide, and has a depth at low water of 18 feet at the foot of the wall, rapidly increasing to 26 feet, and gradually diminishing to a sloping bank on the farther side. The quay wall must be ready for use at any time, and there is much traffic on the river. After explaining these factors governing the launches, Mr. Baxter gave full details regarding supports for the ways, arrangements for stopping the vessels after the launch, lubricants used, etc. The Raleigh was safely brought to rest in fifty-eight seconds after starting down the ways while only forty-nine seconds were required in bringing lines taut on the Texas. Accurate and complete information and data concerning launching velocities and coefficients of friction are of great value in determining the resistances of ships after launching, and the power required to stop them after leaving the ways, and the most interesting part of Mr. Baxter's paper was the description, which he gave, of an apparatus improvised for automatically registering the velocities during the launches of these vessels. Space does not permit of its being reproduced here, but we hope to print it later.

Another method of determining velocity, which was tried at Cramp's when the American Line Steamer St. Louis was launched a few days ago, was explained by Assistant Naval Constructor Tawresey of Philadelphia, who spoke approvingly of Mr. Baxter's paper, and suggested that the society should encourage the collection of practical data of this kind, which could be collected without great trouble or expense. Naval Constructor Stahl of San Francisco, told of how vessels launched on the Pacific coast are brought to a stand-still without the use of lines, anchors or tugs, by being run into a mud hill, and Messrs. Holloway and Pankhurst related their experience with sidewise launches on the lakes, where hulls of large dimensions have been dropped into a 60-foot channel and even into dry docks.

### YACHTS IN AMERICA AND ENGLAND.

The paper on this subject by Louis Nixon, superintending constructor at Cramps, was a very clear and concise statement (somewhat historical) of the different conditions that have ruled in yachting here and in England, and the changes that are making the yachts of the two countries more and more alike; or in other words the appropriation of points of superiority by the rival designers. But Mr. Nixon advanced a few opinions throughout his paper that made it very interesting. He said, for instance, that on account of the fewer boats being built here and the uniformity of our courses the best one soon developed her merits, so that the uncertainty which is the charm of English races, and which is brought about by the general conditions of weather, the courses, the rules and the sailing customs, is absent to a large extent with us. It is this chance of uncertainty which keeps up the sport in England. More jockeying is allowed and their courses call for much more handling of sails, hence crews become more expert and will continue so till we have more racing. Of the centerboard he said: "It is a device which so far as the true aim of yachting is concerned is neither seamanlike nor sportsmanlike. The true aim of yachting is to develop alike the art of the naval architect and the skill and alacrity of the sailor in turning to use nature's own motive power at sea, the wind. This aim pre-supposes a hull of simple lines and sections which shall be permanently uniform or the same under all conditions; that is to say, a keel boat. The centerboard violates this principle flagrantly. It is a mechanical device not properly a part of the vessel. It is the introduction of mechanics into a science which is intended to deal purely and primarily with the forces and the difficulties of nature alone.

Reliable yachting data is very hard to obtain, Mr. Nixon says, but he gives in his paper a table containing a fairly accurate statement of the length on water line, beam, draught, displacement and sail area of the Vigilant, Britannia, Valkyrie and ten other recent yachts. Plans accompanying the paper include the following: Approximate sections of Vigilant; approximate sections of Britannia; approximate sections of Valkyrie; comparative midship sections of the Vigilant, Valkyrie, Thistle, Volunteer, Mayflower, Genesta, Puritan and Galatea; longitudinal and transverse sections of the Mayflower, Puritan, Volunteer, Galatea, Genesta and Thistle; lines of the America; sail plan of the America.

### PAPERS THAT WERE NOT DISCUSSED.

From this point in the last session discussion of papers was practically at an end, as the hour for the banquet that was to close the meeting was at hand. Three papers remained on the list. One of them, on "An Approximate Formula for the Wetted Surface of Ships," contributed by W. F. Durand and G. R. McDermott, who are in charge of the school of marine engineering and naval architecture at Cornell University, was to be read only by title, as it was purely mathematical. The titles of the others were "Accessibility and Circulation of Water Tube Boilers," by L. D. Davis, M. E, president of the Davis-Farrar Co. of Erie, Pa., and "Recent Light-Draught Gunboats of the U. S. Navy," by J. J. Woodward, naval constructor, U. S. N. Mr. Woodward is superintending the construction of the gunboats building at Newport News, Va., and his paper was descriptive of the boats. It was well illustrated. A feature of Mr. Davis' paper on " Accessibitity and Circulation of Water Tube Boilers " is the claim that no matter what provision there may be for the circulation of water, it will not exist without the presence of a sufficient quantity of heat to cause it, and it follows that the circulation of the water must be governed by the circulation of the heat. Unless this can be accomplished, there is little doubt that in portions of the boiler removed from the furnace the up-flow of water will diminish, and there may be portions of the heating surface receiving so little heat that they are fulfilling the office of down-flow pipes. While there might be no serious objection to this in the case of stationary boilers, in marine service where the saving of weight and space is of the greatest importance, it is not desirable. If greater attention were given to the circulation of heat, and provision then made for the water to circulate, Mr. Davis says, the latter may be trusted to take care of itself. He then describes a boiler that has recently been designed with a view to overcoming the difficulties to which he refers.

The social feature of the meeting, the banquet which occurred on Friday evening, was one of the grandest affairs of its kind ever held at the Brunswick. Throughout the sessions of the society, distinguished visitors from Washington and from ships in the port of New York were quite numerous. Naval attaches from among the representatives of Russia and Germany in this country listened to the discussion at the opening session of the society, and Admiral Gerhardi and Mr. Herreshoff, the famous blind designer of yachts, as well as all of the leading officers of the United States navy, who are members of the society, were in attendance at the banquet. The seating of guests and other details attendant upon arrangements for the banquet were looked after by Constructor Bowles. No set programme of toasts had been arranged, but there was no lack of patriotic addresses and warm commendation for the officers of the society and for the progress that had been made in the period of little more than a year that had elapsed since its organization. In this connection it is due to Assistant Naval Constructor Washington L. Capps, secretary and treasurer of the society, to say that his sacrifice of time and labor in taking up the duties attending these offices for another year is highly commendable. Mr. Capps had been offered a salary by the council of the society, but he refused it, feeling that he can render better service through members knowing that his efforts are entirely in behalf of advancement of the aim of the society. A little later on, when the condition of the treasury will warrant it, it is probable, however, that Mr. Capps will be given an assistant, who will relieve him of clerical work.

## Fall River Line Passenger Steamer Priscilla.

Considering her cost, size and performance the Priscilla is probably the most wonderful paddle wheel steamer in the world. She was contracted to the W. & A. Fletcher Company, who let the building of the hull to the Deleware River Iron Ship Building and Engine Works, Chester, Pa. She cost, complete, about $1,500,000, and can make better than 22½ miles an hour on the run of 181 miles, New York to Fall River.

Engines, boilers and fittings, with water in boilers, weigh 1,762 tons, and electric equipments 32 tons. Forty-five miles of wire was used to connect the 1,900 lights furnished by the installation of the General Electric Company. The electric bell outfit includes 16 miles of wire. Over 54 tons of paint, oil etc., were used on the hull and cabins, and nearly 200,000 sheets of gold leaf were used in her decoration.

With 122½ pounds of steam, vacuum 26 inches, and 24½ revolutions per minute, the engines developed 9,345 horse power. 1,345 more than contracted for, and 845 more than the agent for Serve's tubes agreed if that style of tubes was used. The two high pressure cylinders gave 4,664 and the two low pressure cylinders 4,681 horse power. Cut off on high pressure cylinder was 62 per cent. of stroke. It is expected that later trials will give even greater horse power. The coal consumption is 124 tons anthracite pea, per round trip from New York to Newport.

The dimensions and proportions of the Priscilla are as follows: Length over all 440½ feet; length on water line, 423½ feet; beam, outside plate, 52½ feet; width over guards, 92½ feet; depth of hold at lowest point of sheer, 20½ feet; depth of hold amidships, 21⅓ feet; draft of water 12½ feet; displacement, 4,550 tons; cargo capacity 800 tons.

The machinery consists of a double inclined compound engine, in general arrangement like that of the Plymouth of the Fall River Line. The inclined form was adopted because the beam of an engine of sufficient power would be greater than the stability of the hull would permit. There are other advantages. There are two high pressure cylinders. each 51 inches in diameter, and two low pressure cylinders, each 95 inches in diameter—all having a stroke of piston of 11 feet. The wheels are of the feathering type, 35 feet in diameter and 14 feet face. She has ten return tubular boilers of the Scotch type, each having three furnaces, giving a total grate surface of 850 square feet. There are two superheaters, supplied with steam by the ten boilers, and two smokestacks, as in the Puritan, and similarly arranged. The boilers are 14 feet in diameter and 14½ feet long, and constructed for a working pressure of 150 pounds per square inch; indicated horse power 8,000. The pumps are of the Blake pattern.

The quarter-deck of the new vessel is considerably larger than that of the Puritan. From the quarter-deck a main staircase leads to the grand saloon. Between the quarter-deck and the dining room a section of the main deck occupies the entire width of the vessel, appearing a sort of vestibule opening upon both the dining room and quarter-deck. From this vestibule, stairways lead to the grand saloon above, and to the mens' berth-room and the kitchen below. There are no berths or sleeping rooms in the dining room.

The dining saloon will seat 280 people at one time. Its finish and decorations are on an entirely new and unique scheme, and will surpass anything of the kind to be found in any other boats of the line. It is located on the main deck. Aft of the dining room is located the ladies' cabin, approached by stairway from the main saloon. The boat will carry 1,400 passengers and crew, and will have a cargo capacity of 800 tons.

The following detail as to the construction of the steamer, was was furnished by Stevenson Taylor of the W. & A. Fletcher Co.: The center keelson or backbone consists of a steel plate 42 inches deep, connected to the double plate keel by two strong angle bars, and to the floor stringer plates, also double, in the same manner. On each side of this keelson are five longitudinals extending the whole length of the vessel, the third one from center being water-tight. These longitudinals vary in depth from 42 inches to 36 inches as their position approaches the sides of the boat. The margin plate bounding the outer edge of the water bottom is 24 inches wide, and is made water-tight by stapling around the frames, the reverse bars being cut at this point. Above the water bottom the frames of the vessel consist simply of the two angles, frame and reversed bar, riveted together. Midway between the margin plate and deck stringer is a side stringer 27 inches wide, supported by gussets on alternate frames.

The gunwale structure of the vessel consists of a lodger plate secured to frames by gussets, and upon which the main deck beams of I section are landed. This lodger plate is the depth of the beams which amidships are 12 inches deep below the deck stringer proper, this latter being a string plate extending over the gunwale on the outside to take the guard beams, and extending inboard on the beams to take the deck. The proportion of stringer on the deck to that overhanging the gunwale is as 3 to 1.

The transverse frames are thirty inches, center to center, strongly riveted to the center keelson and to the longitudinals which pass through them, and forty-two inches deep within the double bottom amidship. They are made up of the bracket and skeleton construction alternating. At distances of about thirty feet, water-tight floors are inserted as boundaries for the water-tight compartments. Directly under the engine keelson, all the floors are made on the bracket order with more metal left in them, top and bottom, than generally, throughout the double hull, to insure absolute freedom from motion in the bottom when engines are working.

As already stated, the deck beams of this vessel are of I section, and are not, as is customarily done, riveted directly to the frames by welded knees. As the riveting of these beams to alternate frames would make too great a shift, the builders have adopted the shelf or lodger-plate constructon. The shelf, being strongly secured to every frame by gusset plates, makes a good and substantial support for the beam end, and as they are 45 inches apart, every other one comes over and is riveted to a frame which extends through and above the lodger plate. Besides, as the ends of the beams come between the lodger and deck-stringer plates, they will be securely riveted to both through top and bottom flanges.

A feature of the Priscilla that will attract attention from engineers is her equipment of Serve ribbed steel boiler tubes. The St. Paul, sister ship of the St. Louis, is also being fitted with these tubes, and there are now, in all, eighty steamers so fitted and working successfully. Mr. Charles W. Whitney, of New York, sole agent for this tube in the United States and Canada, directs attention to its efficiency in an advertisement elsewhere in this issue. Mr. Whitney is also sole agent here for Purves' ribbed steel furnace flues and for Ellis and Eaves induced (or suction) draft.

## Twin-screw Sound Steamer City of Lowell.

The supremacy of the paddle-wheel passenger steamer on the Sound will have to be divided with the screw steamer, in speed at least. The City of Lowell, designed by A. Cary Smith and built by the Bath Iron Works, for the Norwich and New York Transportation Company for the New York and New London route, made the run of 125 miles in 5 hours and 34 minutes, averaging 22.4 miles an hour. Her maximum speed was 23.45 miles an hour. The engines averaged 145 revolutions with a steam pressure of 160 pounds.

The principal dimensions of the City of Lowell are: Length of keel, 320 feet; length over all, 336 feet 1 inch; beam, moulded, 49 feet 6⅛ inches; beam, over guards, 66 feet; draught, loaded, 13 feet; depth, main deck to keel, 20 feet 4 inches; tonnage, 2,400 tons.

The hull is constructed entirely of steel, with four complete transverse watertight bulkheads. She has five decks named respectively lower, main, saloon, gallery and hurricane, and all the work above the main deck, with the exception of the machinery and boiler hatch casements and also a few deck beams, which are placed for additional strength, will be of wood. The lower decks forward and aft are devoted entirely to the crew and free-berth passenger accommodation, there being ninety free berths forward and 102 aft, while forward of all the crew, deck hands and table waiters, sixty in number, are berthed, also the three second class cooks. About 200 feet of the main deck amidships is devoted exclusively to freight and separated from the living spaces in all respects. On the after part of this deck is a commodious social hall, just aft of which is a hallway containing a handsome staircase, which leads to the saloon deck; also a gentlemen's wash room and comfortable quarters for the purser and freight clerk. Aft of all is situated the ladies cabin containing six double-berth staterooms, twenty-seven free berths and the necessary wash rooms, etc. At the forward end of the deck is placed the Hyde patent steam windlass and the Williamson steam steerer. There is also berth accommodation for ten firemen and four coal passers on the port side, while the mess rooms, water closets, etc., for the crew are on the starboard side.

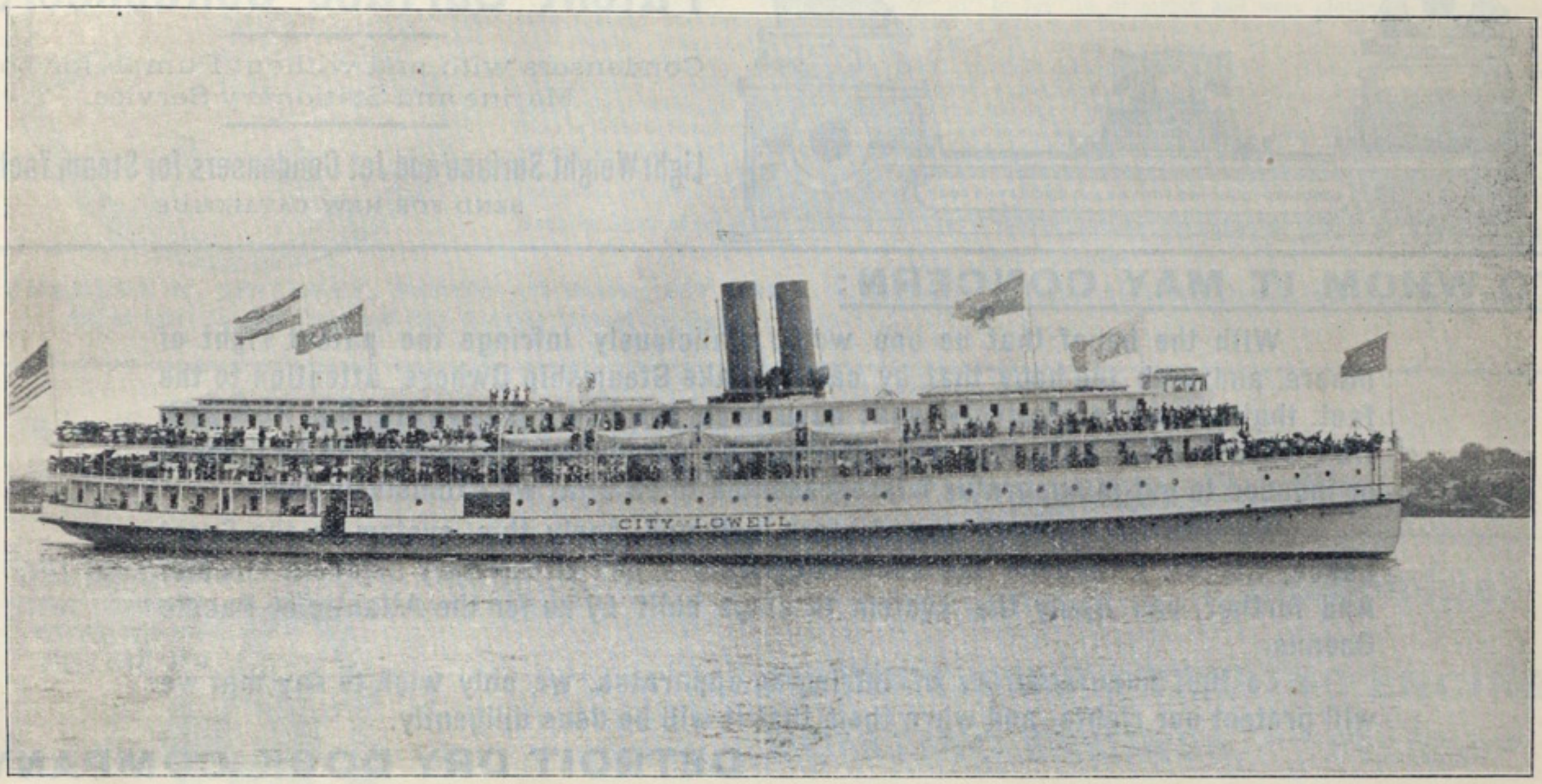
The saloon deck is devoted entirely to the accommodation of first class passengers, and contains eighty-one double-berth state rooms and twenty-five rooms with brass bedsteads. About midships are the engine and boiler hatches, and the former is so arranged that the passengers can see right into the engine room and watch the workings of the powerful machinery.

The dining room, kitchen and smoking rooms are on the gallery deck, and also thirty-five double-berth state rooms. At the forward end is the pilot house, just aft of which and in direct communication are the state rooms for the pilot and captain. A large dining room then extends for sixty-eight feet the whole width of the deck, a stairway from here leading to the huricane deck. The space around the engine and boiler hatches contains the cafe, officers dining room and staterooms for the cashier, stewards and first class cooks on the port side, and the kitchen with starerooms for the engineer, mate, oilers, etc., on the starboard side. At the extreme aft end of this deck are the staterooms for passengers. A gallery or balcony is placed here, and a handsome stair case leads below to the saloon deck.

The propelling power consists of two independent sets of verticle inverted direct acting triple expansion engines, driving twin screws, the

cylinders being 26, 40 and 64 inches diameter, respectively, with common piston stroke of 36 inches. The engines were especially designed by Charles E. Hyde, superintendent of the engineering department of the Bath Iron Works, a man well known by engineers as having designed and superintended the construction of the first triple expansion engine built on this continent. The boilers are six in number and of the Scotch return tubular type. Their length is 12 feet 10 inches and diameter 13 feet 6 inches. They are each fitted with three corrugated furnaces 43 inches in diameter, and are designed for a working presssure of 165 pounds to the square inch. The boilers are placed three on the starboard and three on the port side of a boiler room 44 feet long by 49 wide, and two oval smoke-pipes 9 feet by 7½ feet carry off the refuse gas and smoke. The total estimated I. H. P. of the engines is, including all auxiliaries, 4,600. which with 145 revolutions per minute was designed to develop a speed of 20 knots, or over 23 miles per hour. The engines, boilers and coal take up 14 feet of the vessel's length amidships, the total coal bunker capacity being 90 tons, sufficient for the vessel to steam one round trip. The vessel is to be fitted with Horace See's patent ash apparatus and with Worthington pumps throughout. The electric plant will consist of two units each including a large dynamo and 70.H. P. straight line engine. Each unit will be capable of lighting the whole ship, there being 700 lights, and also a powerful search light of the most approved pattern on the pilot house. The electrical plant will be placed in the main engine room and the dynamo and engine will be connected by a belt. The vessel will be fitted throughout with electric light fixtures from Page Bros. & Co. of Boston. The following boats will be carried: Six 22-foot metalic life boats; two 20-foot wooden boats, clinker built and square stern; one 15-foot wood dinghy, and two life rafts, The three anchors will weigh 2,800, 2,200 and 1,800 pounds respectively. She will have no spars.

The following concerns were interested in her equipment: General Electric Co,, elelectric installation; J. T. Hall and & Co., New York, N. Y., carton-piere decorations; Thos. Drien & Son, Wilmington, Del., boats and life rafts; Williamson Bros., Philadelphia, Pa., steam steerer; Camden Anchor Works, Camden, Me., chains and anchors; Randolph & Clowes, Waterbury, Conn., copper tubes.

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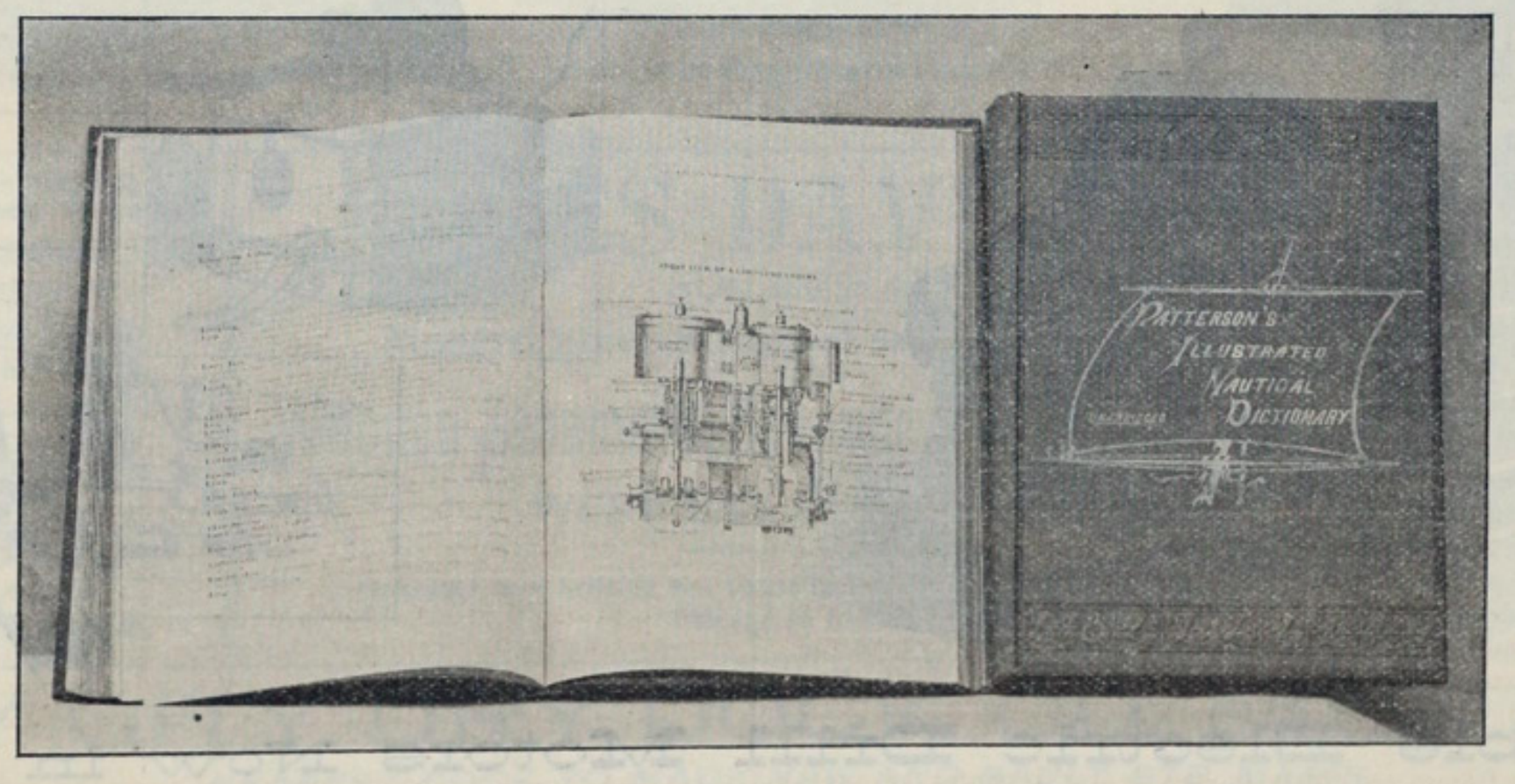


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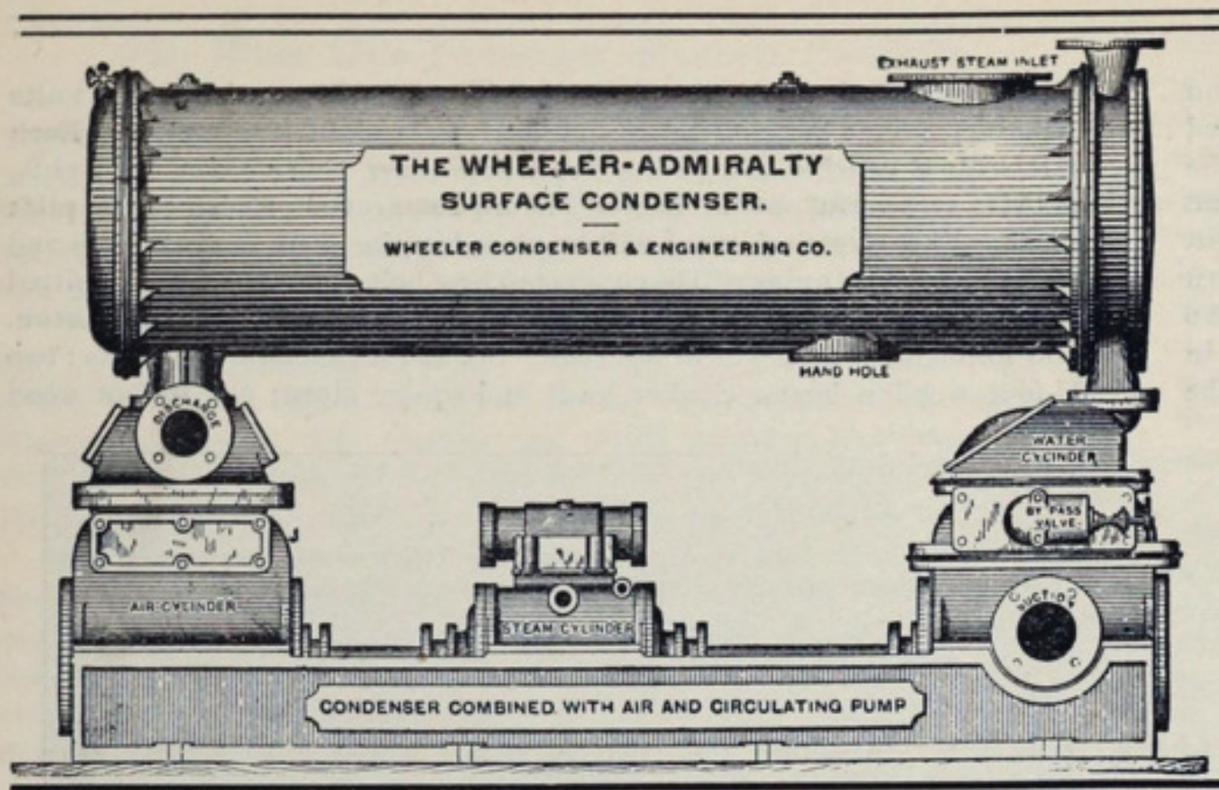


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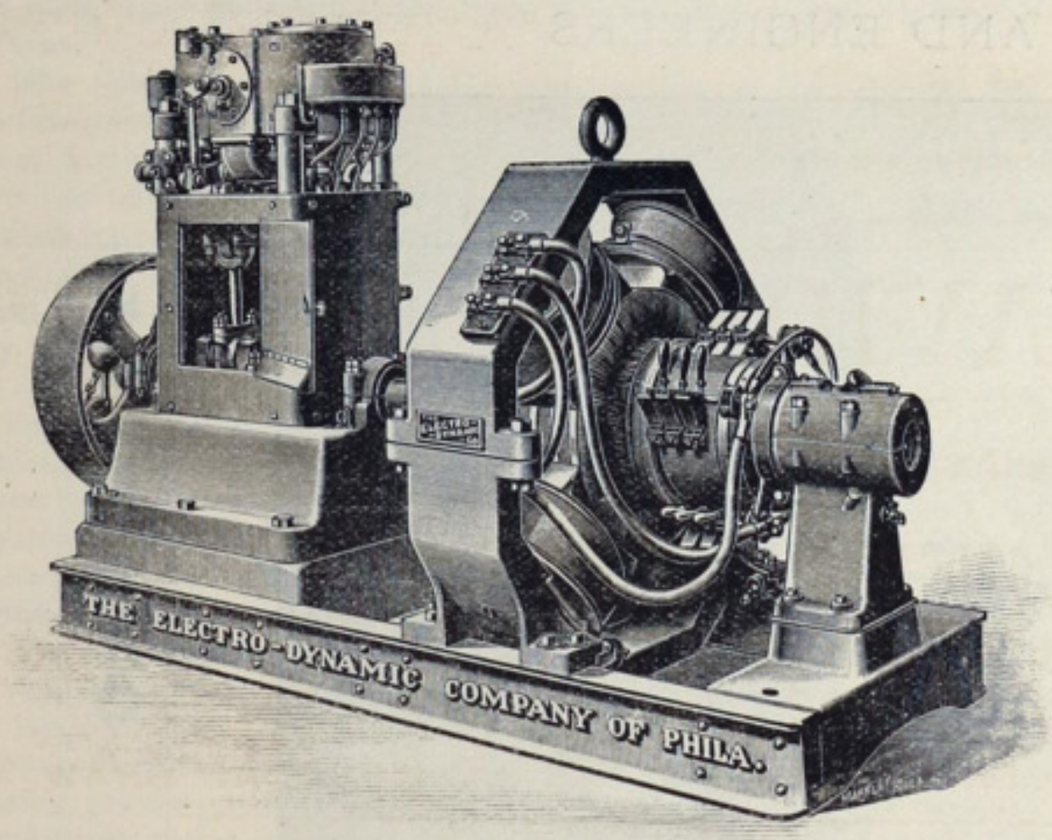
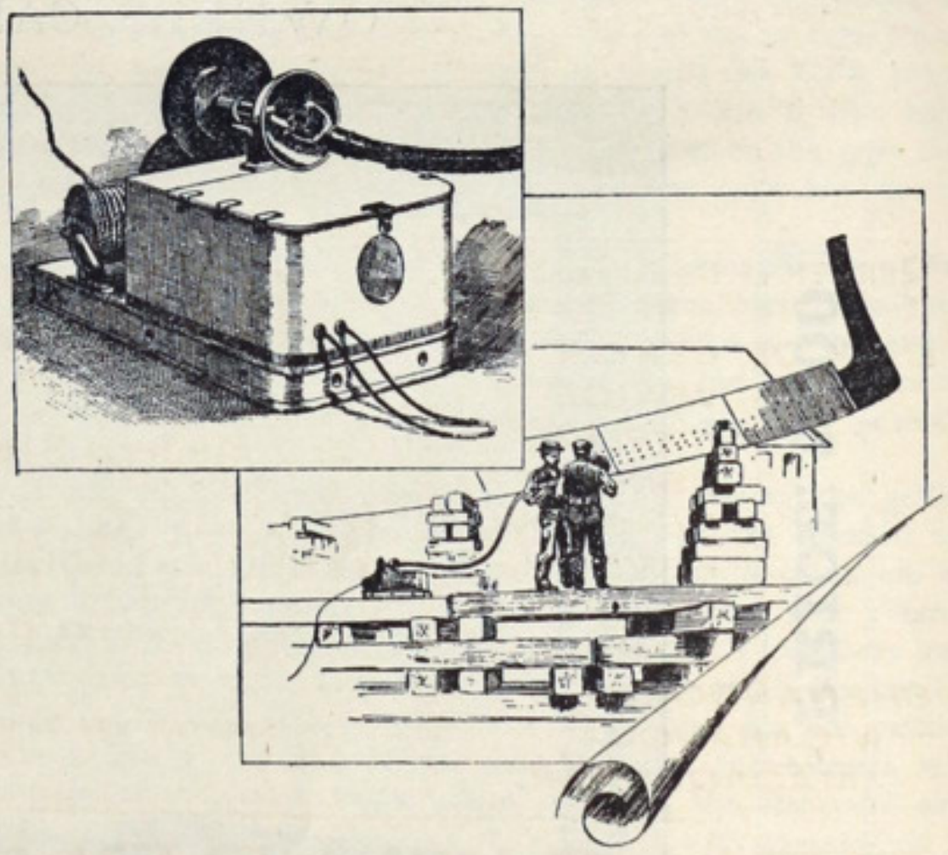
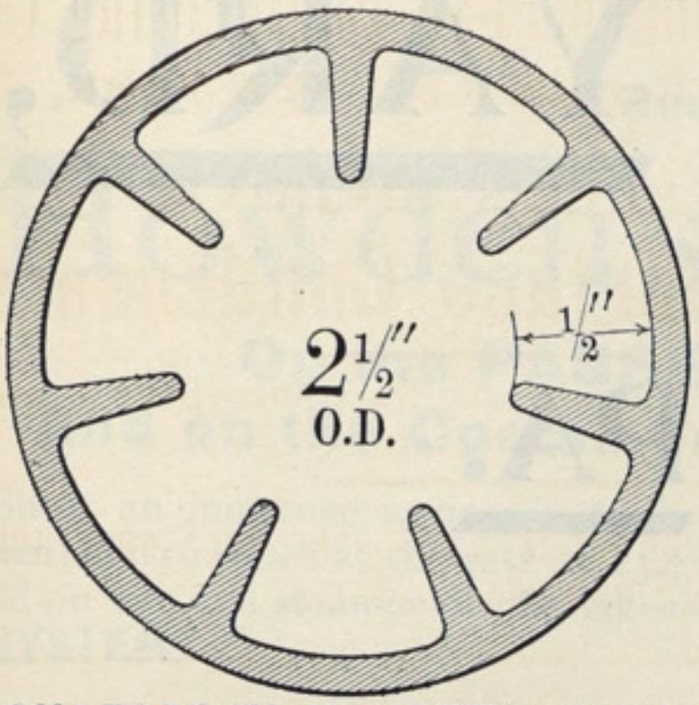


## Portable Electric Drill Motors Now in Use at

**Cramp & Son's Ship and Engine Building Co.,**
**Newport News Ship Building and Dry Dock Co.,**
**Samuel L. Moore & Sons,**
**Union Iron Works,**
**Brooklyn Navy Yard, and**
**International Navigation Co.**

# SERVE'S RIBBED STEEL BOILER TUBES.




**IN USE ON STEAMER PRISCILLA, ILLUSTRATED IN THIS ISSUE.**

**Being Fitted to American Line Steamer St. Paul, Sister Ship of the St. Louis. Also Working Successfully in Eighty Other Steamers.**

*Engineering of London, issue of Oct. 5, 1894*, makes mention of a series of experiments "on the relative efficiencies of Serve and plain boiler tubes. A set of model boilers were used through which were placed a Serve tube and a plain tube. The tubes of one boiler were coupled to those of the other, and Siemens' pyrometers were fitted at the end of each tube. A blowpipe gas get was then caused to send its flame through one set of the tubes. The pyrometer temperatures were noted, and also the evaporation effected. The boilers were 21" by 7½" in diameter, and were clothed with asbestos and cotton wool. The Serve tubes, obtained from Messrs. J. Brown & Co., were 2½" in diameter outside, and 2 3/16" inside. They had seven ribs, 1/16" deep by 3/32" mean thickness. The plain tubes were of iron, and were made by Messrs. A. & J. Stewart & Clydesdale, Limited, of Glasgow. These were 2⅜" in diameter outside; and 2" inside. The mean of several experiments showed that with a temperature of 1000 deg. Fahr. at the blowpipe end of the boilers, and 500 deg. Fahr. at the uptake end, the Serve tube transmitted 6000 British thermal units per square foot per hour, and the plain tube 4500 British thermal units per square foot per hour. The area measurements were made on the outside or emission surfaces of the tubes. From these experiments it would seem that the Serve ribs are very efficient heat collectors, when hot gases are passed through the tubes.

**Made in Steel of all Sizes, from 2 1-2 to 4 Inches Outside Diameter; of Brass or Copper From One Inch Upwards.**

**CHARLES W. WHITNEY,** Manhattan Life Building, NEW YORK, N. Y., Sole Agent for United States and Canada; also Sole Agent for Purves' Ribbed Steel Furnace Flues and Ellis & Eaves Induced (or Suction) Draft.

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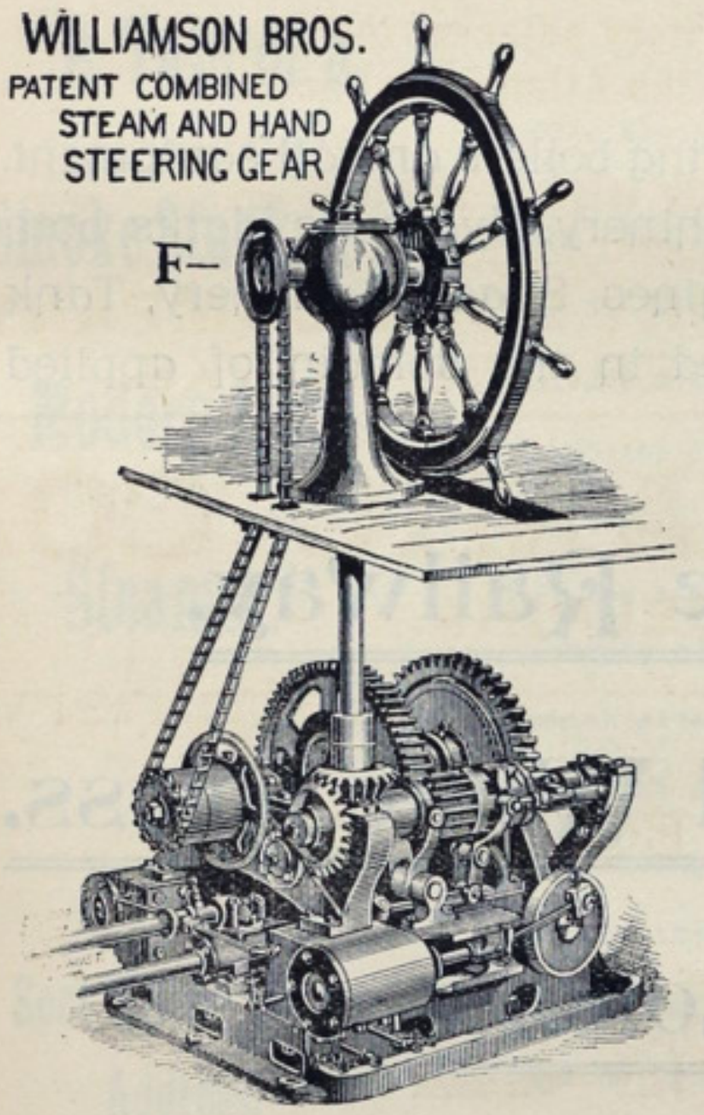
# Williamson Brothers,

## Engineers, CORNER OF RICHMOND AND YORK STS.,

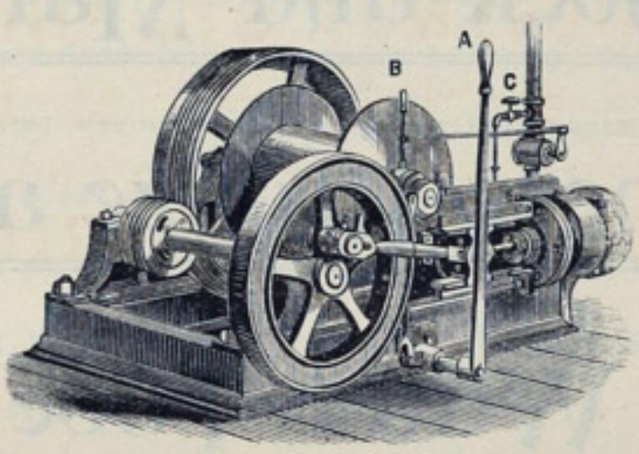
## Philadelphia.



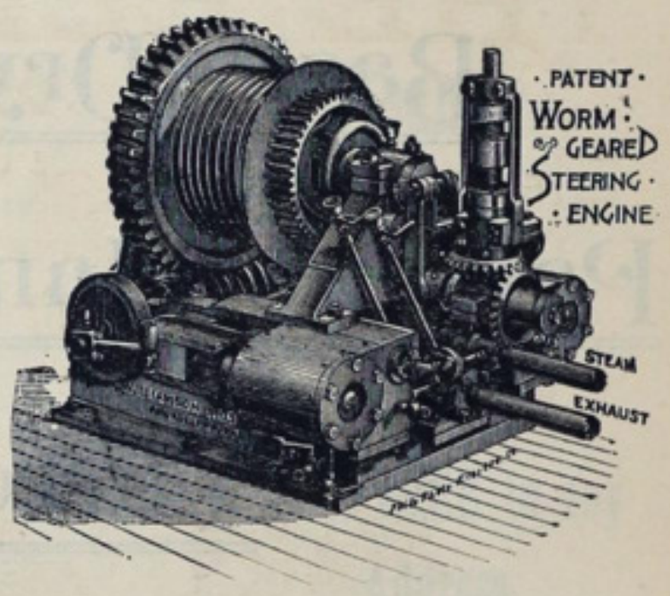

**PATENT SHIP STEERING ENGINES,**

**HOISTING ENGINES,** with either Frictional or Spur Gear,

**LOCOMOTIVE STEAM CRANES, &c.**




FRICTION GEARED HOISTING ENGINE.

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BUILDER OF

**Modern Steel-Strapped and Steel-Arched**

## Wooden Steamers, Schooners and Tow Barges,

**WEST BAY CITY, MICH.**

(Schooner now building has capacity for 100,000 bushels of wheat, Chicago to Buffalo.)

BUILDER of the following Modern Wooden Steamers:

*CITY OF BERLIN,*
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BUILDER of the following Wooden Schooners and Barges:

*GRAMPIAN,*
*ABERDEEN,*
*DUNDEE,*
*PAISLEY,*
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# BAY CITY DRY DOCK CO., BAY CITY, MICH.

*NEAREST DOCK TO MACKINAW AND SAULT STE. MARIE.*

Admits Vessels 300 feet Keel, 42 feet Beam and 13 feet Draft.

# CRAMP'S SHIP YARD,

# PHILADEPHIA, PA.

**Battle Ships,** Cruisers, (armored and protected); Torpedo Vessels, all with armament and equipment complete.

**Modern** Breech-Loading, Rifle Cannon, Gun and Mortar Mounts, suitable for any calibre, for Naval, Sea-Coast or Field use.

**Steam Machinery** of every description, including boilers and all equipment, Marine Engines of any desired power, Mining Machinery, Hydraulic Plants, both for pumping and for power. Furnace Blower Engines, Sugar Machinery, Tank Work; in short, every device or appliance embraced in the domain of applied mechanics.

## Basin Dry Dock and Marine Railway.

## Parson's Manganese Bronze and White Brass.

## Yarrow Water Tube Boilers.

**Area of Plant** — Thirty-two acres. Area covered by buildings, fifteen acres. Delaware River front, 1,543 feet.

**Largest** and most powerful Floating Derrick in the World; capacity 130 tons, with 60 feet hoist and 36 feet out-hang of boom. Number of men employed, about 6,000 in all departments.

**At once,** the greatest and most complete Ship and Engine Building establishment, and the best appointed Naval and Military Arsenal, in the Western Hemisphere.

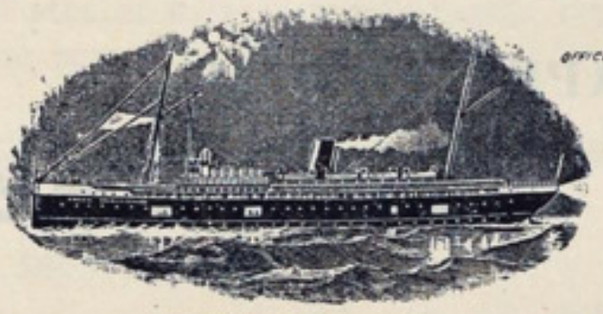
# "A DOLLAR SAVED IS A DOLLAR EARNED."

**Results Obtained from the Application of**

# Howden's Hot Draft System

**On the PASSENGER STEAMER VIRGINIA, (See Letter Below,)**
**And on the Coarse Freight Carrying STEAMER HARVEY H. BROWN,**

Show an immense saving in fuel. A ton of cargo carried a mile on 8-10 of an ounce of fuel, or a ton of cargo carried 170 miles at the rate of 13.2 miles per hour on a cent's worth of fuel, are performances that have been attained on but one steamer on the lakes—that steamer is the HARVEY H. BROWN fitted with **HOWDEN'S HOT DRAFT SYSTEM.**



OFFICE OF THE PRESIDENT.
GOODRICH TRANSPORTATION Co
FOOT OF MICHIGAN AVENUE.

A W GOODRICH, PRESIDENT

Frank E. Kirby, Esq.,

Chicago Dec. 20th, 1893.

c/o Detroit Dry-Dock Co.,

Detroit, Mich.,

Dear Sir --

In reply to your letter of the 18th inst. inquiring about the results of the Howden System of Forced Draught now in use on our S. S. "Virginia", will say that since it has been in use we have had steady steam, and burned slack coal, which costs us $1.10 per ton less than the coal we were forced to use before we introduced the Howden System.

At the same time we applied the Forced Draught we also supplied the "Virginia" with new Condensing apparatus built by the Knowles Co., which gives a better vacuum requiring much less steam to operate than the original plant supplied by the builders.

Our saving in the price of coal has been 50 o/o. We attribute 33 1/3 o/o of the saving to the Howden System, in enabling us to burn a cheaper grade of coal and maintain steady steam.

The balnace or 16 2/3 o/o we credit to the Condensers made by the Knowles Co.,

We are so well satisfied with the results on the "Virginia" that we have since fitted the "Atlanta" with the Howden System and are now putting it in the "City of Racine," and "Indiana."

Very truly yours
A W Goodrich Pres.

"A Tale of a Smoke Stack of a Modern Lake Steamer."

Sent FREE to any Address.

"A Tale of a Smoke Stack of a Modern Lake Steamer."

Sent FREE to any Address.

For further particulars, write the sole owners and manufacturers of the Howden apparatus for the lakes.

## THE DETROIT DRY DOCK COMPANY,

**SHIP AND ENGINE BUILDERS,** **DETROIT, MICH.**

P. S.—"**A cent's worth of fuel, A ton of cargo, A hundred and seventy miles, At 13.2 miles per hour**" is the title of a book being prepared for this company. If you would like a copy, send your name and address.

Office and Works, Front and Penn Sts.

THE

# Penn Steel Casting & Machine Co.

## CHESTER, PA.

MANUFACTURERS OF

## Low Phosphorus, Soft, Open-Hearth Steel Castings

OF ANY DESIRED SHAPE AND SIZE,

**Free from Blow Holes, Solid and Strong.**

Locomotive Castings, Crossheads, Driving Boxes, Driving Wheel Centres, &c.

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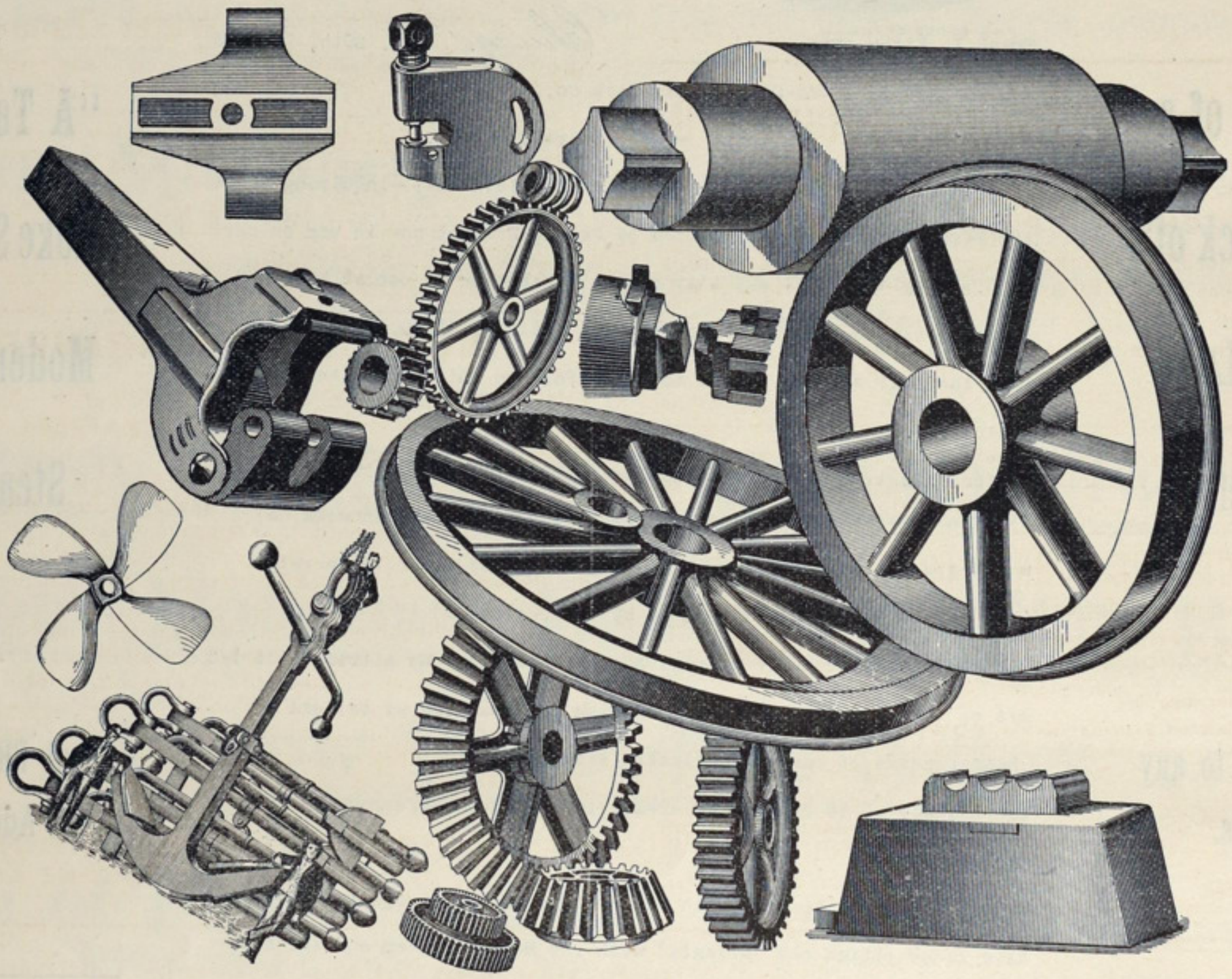
Rolling Mill Castings, Rolls, Spindles, Couplings, Pinions, &c.

✺

Railroad and Car Construction Castings.



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Windlass, Hull and Machinery Castings, Stern Posts, Struts, Stems, Hawse Pipes, Etc.

✺

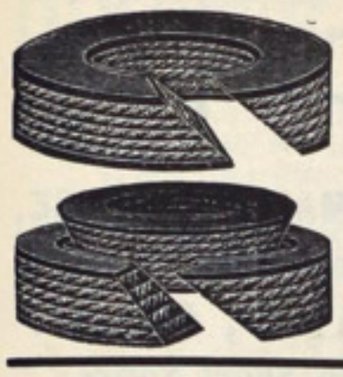
Hydraulic Cotton Compress and Miscellaneous Castings.

STEEL CASTINGS Possessing all the Physical Characteristics of Open Hearth Steel Forgings, having great Tensile Strength and possessing Superior Wearing Qualities:

**FROM TEN TO EIGHTY THOUSAND POUNDS WEIGHT.**

**SPECIAL ATTENTION GIVEN TO LARGE WORK.**

ROLLING MILLS, MARINE STATIONERY AND BLOWING ENGINES, STEAM SHOVEL AND DREDGING MACHINERY, STONE CRUSHERS AND BRICK MACHINERY, MINING MACHINERY AND COAL BREAKER CASTINGS, STEAM HAMMERS, ETC., ETC.



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Our Elastic Ring, Sectional, Spiral and Special Water Packings are the leaders in this line. For Steam, Water, Ammonia, High Speed Work and all places where packings are used they excel. Try our Special Water Packing, fully guaranteed for water end of pumps. See that our trade mark is on each package. Correspondence solicited.

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**THE GARLOCK PACKING CO.**

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IMPORTERS AND MANUFACTURERS OF

*Mahogany, White Mahogany,*

AND ALL NATIVE CABINET WOODS.

HIGH GRADES OF KILN DRIED WOODS FOR CABIN WORK AND INSIDE TRIM.

*White Oak Timbers and Plank*

CONSTANTLY ON HAND AND SAWED TO ORDER ON SHORT NOTICE.

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**FOR SALE...**

**CHEAP IF PURCHASED IN 15 DAYS.**

Best location for marine work, at the greatest ore receiving port on the lakes. A great chance for a first class mechanical engineer who understands repair work.

Full description on application.

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Designers, Contractors & Engineers, for Complete Fuel Oil Equipment.

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**PARKE & LACY CO.**
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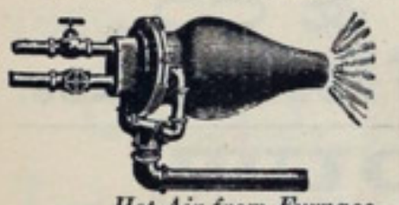

*Hot Air from Furnace.*
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**We have the only successful oil burner on the market for steam yachts with large or small boilers.**

Burners for every branch of Indusiry where heat for any purpose is used.

WRITE US FOR PRICES.

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# WRECKING

TUG SWAIN STATIONED AT MACKINAW CITY.
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ALL WITH WRECKING OUTFITS ABOARD.

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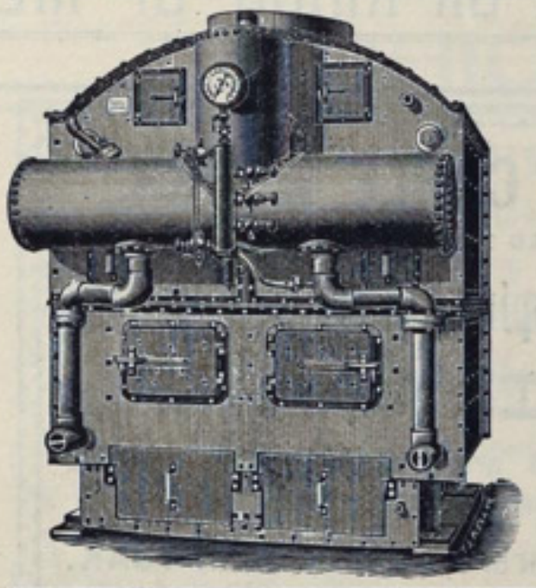

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*SECTIONAL*
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NOW USED IN

18 Passenger Boats from 70 to 160 feet long.
27 Steam Yachts from 50 to 160 feet long.
U. S. Torpedo Boat "Stiletto."
Numerous Small Launches and Stationary Boilers are giving most excellent results.

ALMY WATER-TUBE BOILER CO.,
47 CLIFFORD ST.,
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## NOTICE TO MARINERS.

**FUEL AND DOCKAGE AT POINT AUX PIN—SHIP STORES CONSTANTLY ON HAND—ALGOMA PARK HOTEL AND SUMMER RESORT.**

**ALGOMA PARK, At Point aux Pin, Just Above the Soo, Ontario,** has been opened up as a summer resort by Messrs. Kirkwood & McKinnon of Sudbury, Ont. A new stone hotel, store, parks, etc., are the features, and a dock 200 feet long, with a depth of 20 feet of water, has been built.

The small charge of $1 will be made for tieing up at the dock, for each 24 hours or fraction thereof, for all classes of freight carriers.

They will keep a supply of fuel and ship stores of every description constantly on hand, and will have the dock lighted at night and a bell sounded in thick weather. Masters finding themselves in this locality during thick or unfavorable weather of any kind, are invited to take advantage of the accommodations offered. At out-port of customs and postoffice have been established.

**KIRKWOOD & McKINNON,**
**ALGOMA PARK, Just above the Soo.**
**POINT AUX PIN, ONTARIO.**

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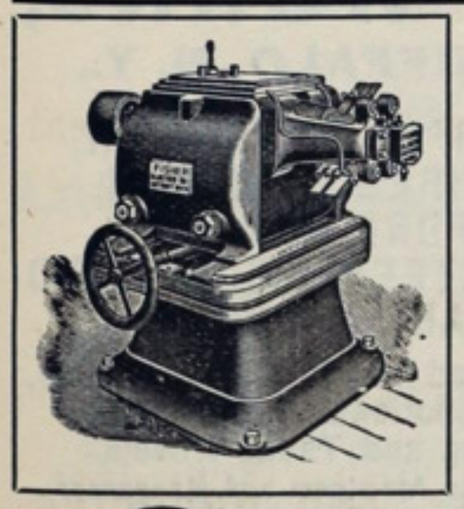

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ALL THE GREAT FLEETS ARE EQUIPPED WITH OUR PLANTS.

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DOCK OFFICE, MAIN ST. BRIDGE.
Telephone 409.
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*Steam Pumps, Hawsers, Divers, Etc., Furnished on Short Notice.*

F. W. WHEELER, President. E. T. CARRINGTON, Vice-President. F. L. GILBERT, Secretary.

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Our DREDGE and CRANE CHAINS are made of IRON ROLLED SPECIALLY for that purpose. Send for Price List.

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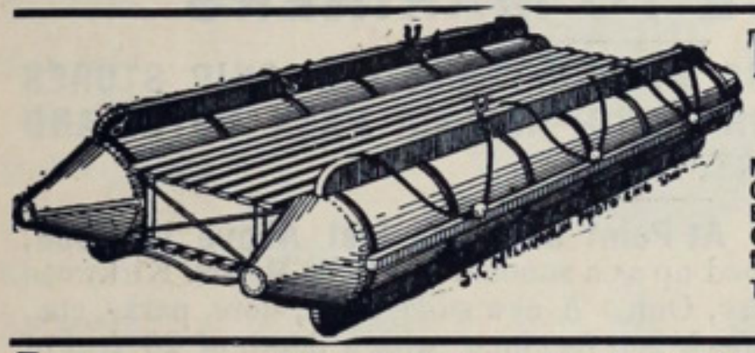

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BUILDERS OF

Metallic Life Boats and Rafts, Government and Pleasure Boats. Block and Granulated Cork Life Preservers. Outfit for Lake Steamers a Specialty.

TATNALL & RAILROAD STS.
Wilmington, Del.

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A Simple, Powerful Machine. Noiseless and Sure.

SEND FOR CIRCULAR.

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For BOLTS, NUTS, WASHERS, RIVETS Etc., Etc.

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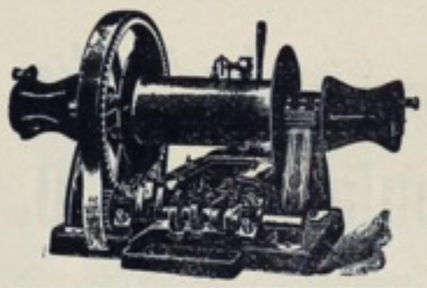

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Vertical, Horizontal, Marine & Locomotive BOILERS Strictly First-Class and Highest Test.

Send for Circulars and Prices. SAGINAW, MICH.

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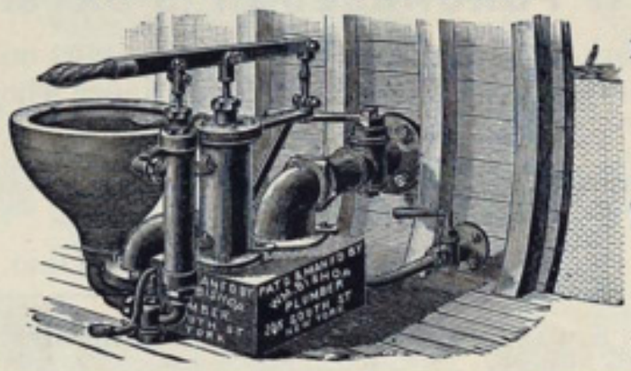

For Yachts, Pilot Boats, Naval Ships, Etc.

For above or below water line. In use on U.S.Cruisers New York, Columbia, and Battleships Indiana, Maine, Texas, Massachusetts, Etc. Our No. 4 can be put in a space 15 in. x 15 in.

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Telephone 569 Franklin.
Yacht Fittings a Specialty.

## SHIP LAMPS.

OIL AND ELECTRIC FIXTURERS

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Steamships, Yachts, &c.

GREAT VARIETY OF DESIGNS.
Prices and Cuts on Application.

PAGE BROS. & CO.,
(FORMERLY WILLIAMS, PAGE & CO.)
227 to 233 Cambridge St., BOSTON, MASS.

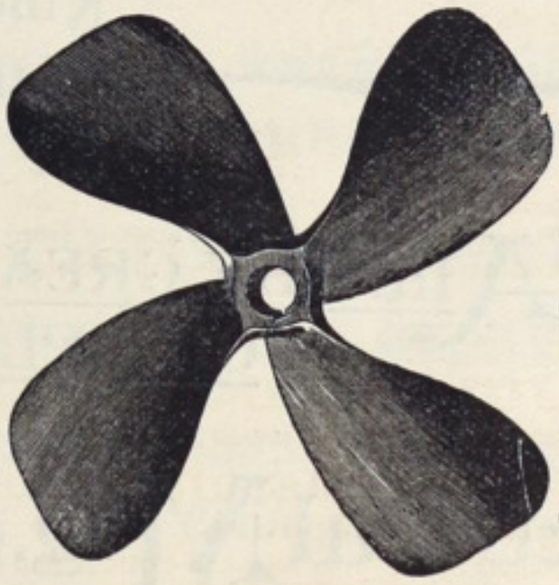
## H. G. TROUT,
## KING IRON WORKS,

BUFFALO, N. Y.,

MANUFACTURERS OF

TRIPLE EXPANSION, THREE CYLINDER, FORE AND AFT And STEEPLE COMPOUND MARINE ENGINES,

High and Low Pressure Engines, Sectional, Propeller. Tug and Yacht Wheels, Cowles Aluminum and Manganese Bronze Propeller Wheels.



These Wheels are noted for their extra speed, towing power and proportionate saving of coal.

PRICES QUOTED ON APPLICATION.

**DIXON'S Grapite Pipe Joint Grease**

Enables you to MAKE A TIGHTER JOINT than you can possibly make with red lead. You can do it easier, and parts can be separated at any time without breaking anything. Send for sample and circular.

**JOS. DIXON CRUCIBLE CO., JERSEY CITY, N. J.**

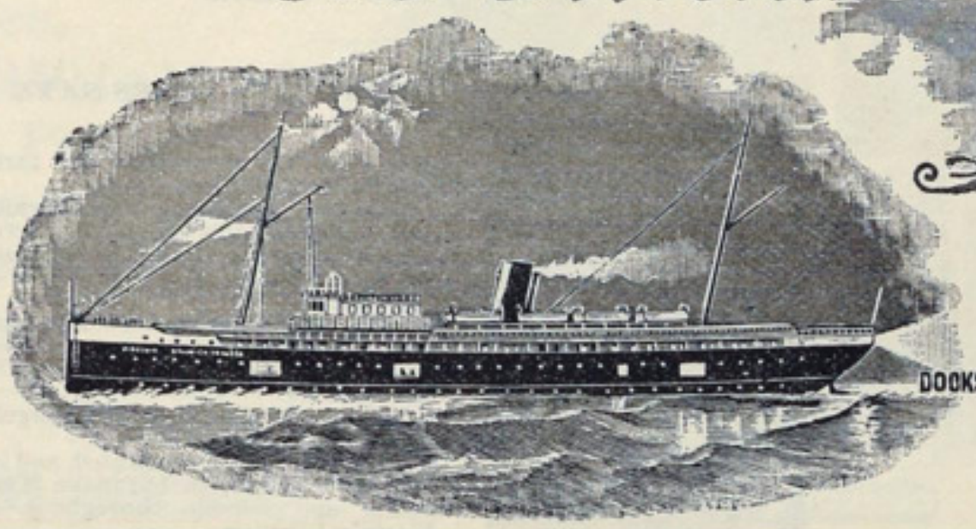
**DIXON'S Lubricating Graphite**

Is fully explained in an INTERESTING AND INSTRUCTIVE PAMPHLET which is FREE to all interested. It will pay all Engineers and Machinists to SEND FOR IT.

**JOS. DIXON CRUCIBLE CO., JERSEY CITY, N. J.**

**E. S. Richardson Fueling Co.**

COAL



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ROOM 7 METROPOLITAN BLDG.

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**For Sale, Cheap**

**STEAMER HENRIETTA,**

Suitable for short passenger or ferry route. Dimensions: 130 feet long, 28 feet beam, and 6 feet hold. Engines: Two horizontal, 14 by 48 inches, steam being furnished by two 12 feet by 42-inch boilers, with 32 3-inch flues. Stern wheel. Draft, light 3½ feet; loaded 5 feet. Capacity 150 tons coal. Two smoke stacks. Address,

**A. W. PRIEST, - Kaukauna, Wis.**

**NOTICE IS HEREBY GIVEN,**

**That MR. RICHARD E. RISPIN,**

Late General Agent of the **SUN INSURANCE COMPANY, of San Francisco**, ceased his connection with the company in that capacity on the 20th day of March, 1894, and is no longer in the employment or in any way connected with said company or its business. All monies or credits due that company being payable only to signature the undersigned.

**H. STEPHENSON SMITH,**

Chicago, Oct. 1st, 1894. MARINE SECRETARY.

TRADE MASON MARK. MASON

**WHEN YOU BUY A**

**REGULATOR**

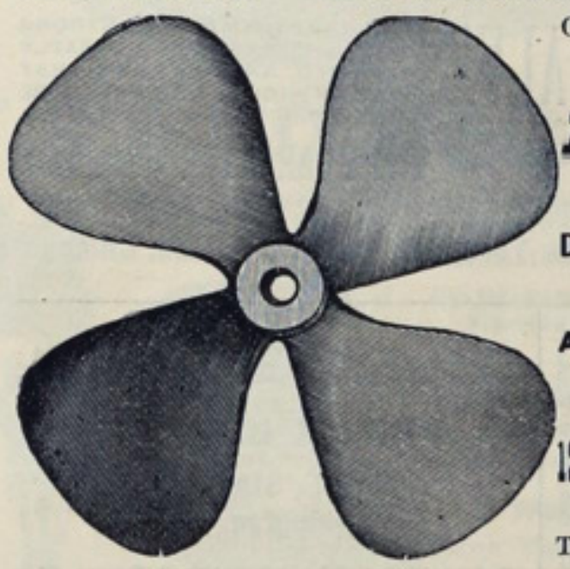
With this Trade Mark on it, You will be satisfied.

**WHY? Because it is a ...MASON**

The best that is made.

**MASON REGULATOR CO., BOSTON, MASS.**

**SHERIFFS MANUFACTURING COMPANY,**



C. STARKE, Pres. W. H. MEYER, V.Pres.
THOS. W. SHERIFFS, Manager.

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**PROPELLER WHEELS,**

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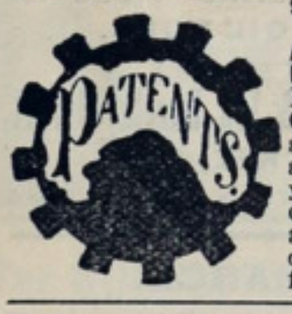


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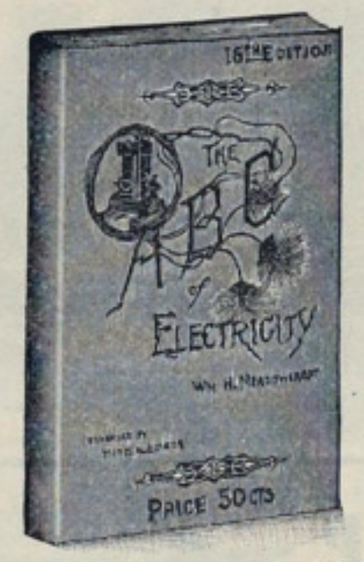


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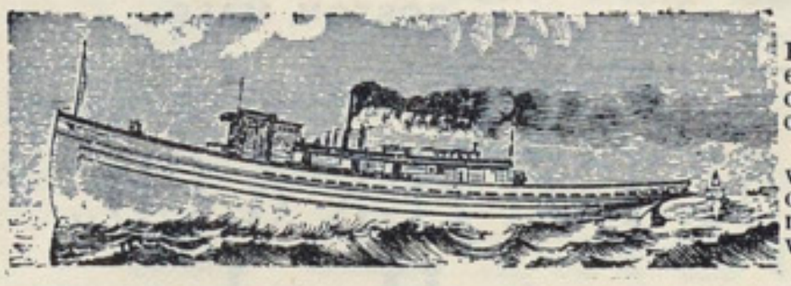

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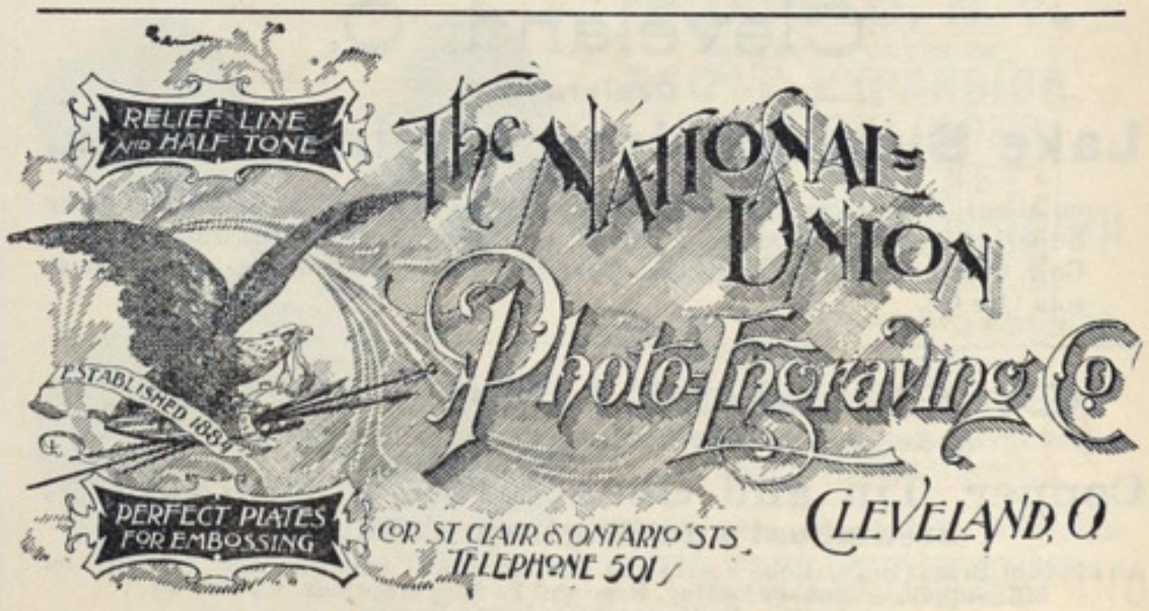

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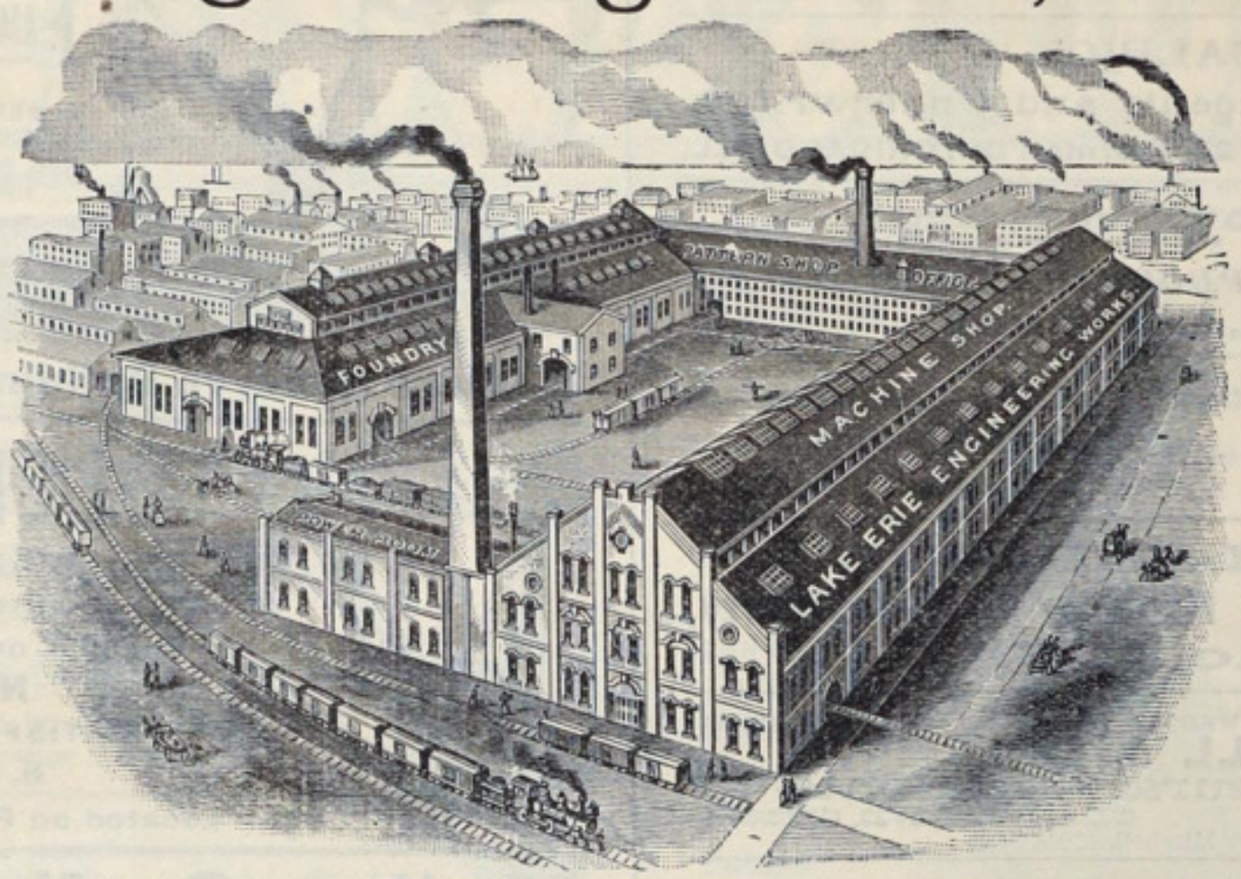


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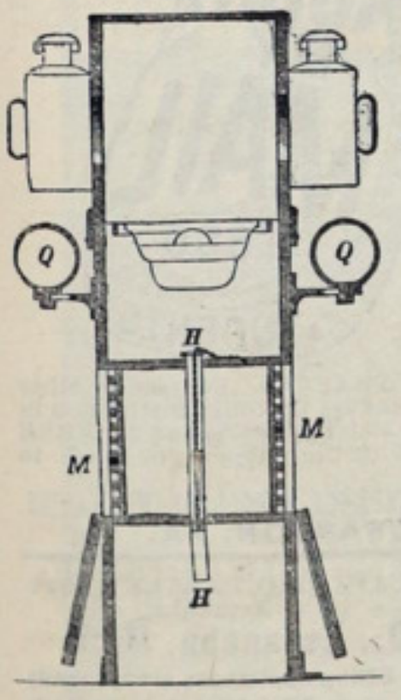


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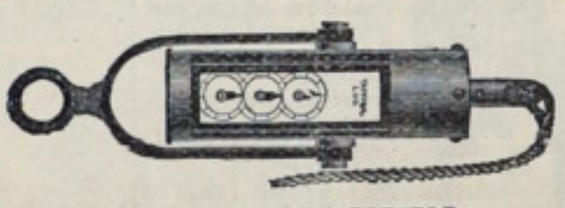

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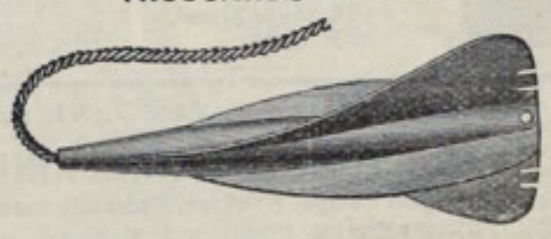

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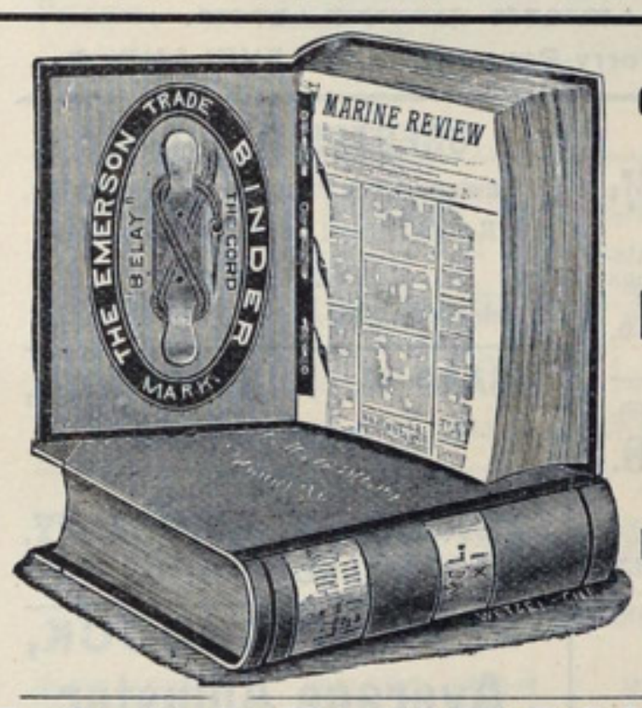


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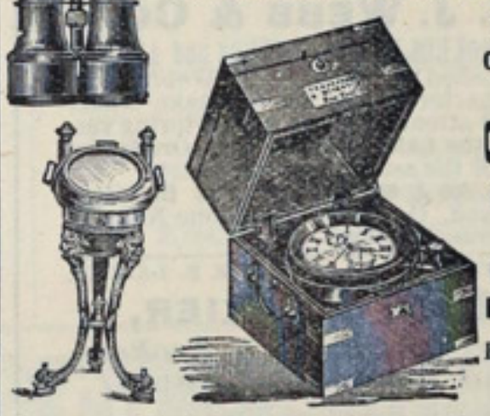

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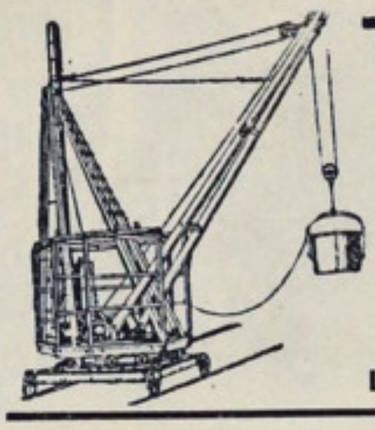
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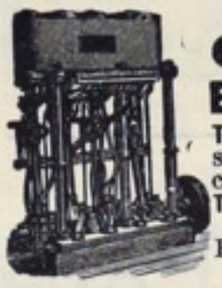
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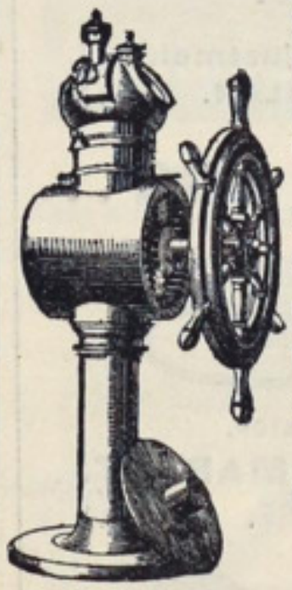
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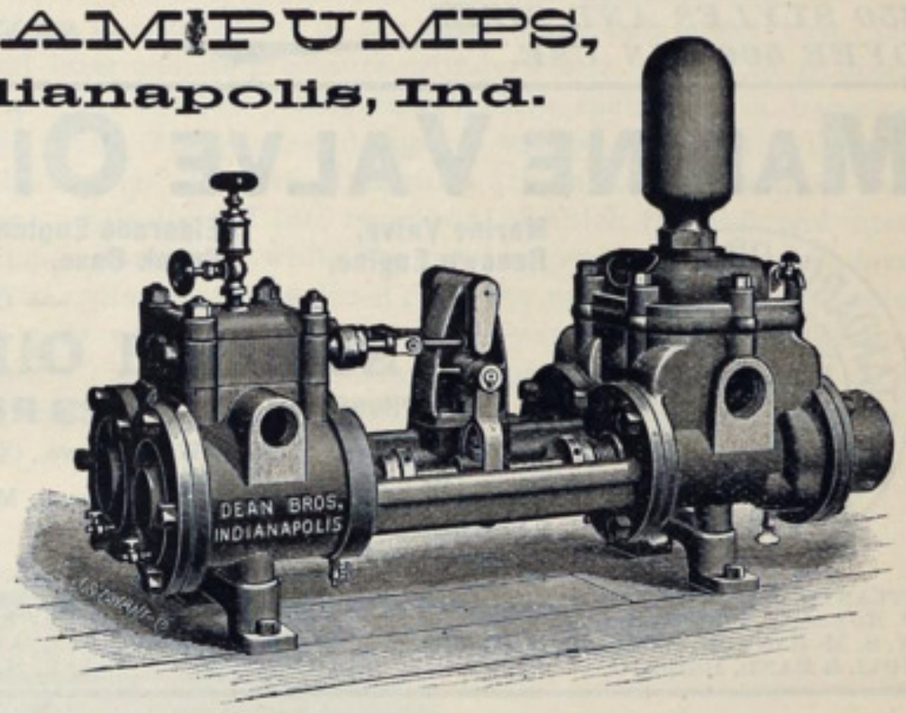


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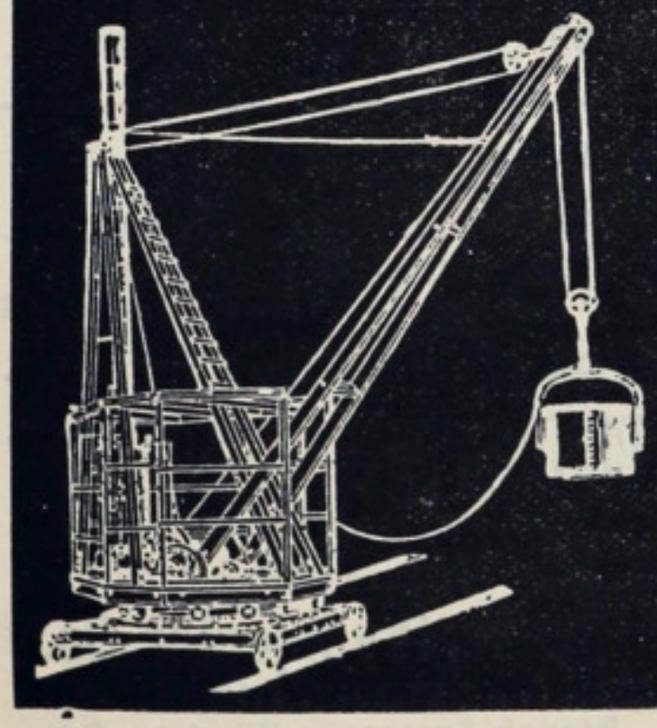
# McMYLER MANUFACTURING CO., 180 COLUMBUS STREET, CLEVELAND, O.

SOLE MAKERS OF THE

## McMYLER PATENT REVOLVING STEAM DERRICK



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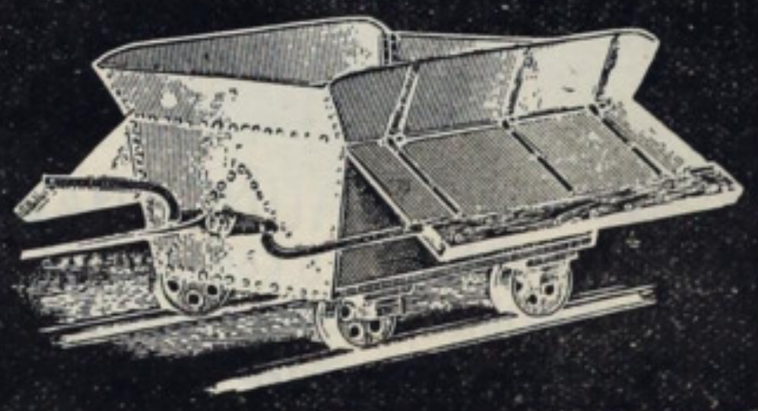

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Marine Valve, Renown Engine, Eldorado Engine, Crank Case, Victor Signal, Dark Lubricating, Mineral Seal, Head Light, Artic Cup Greases, and Lard Oils.

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West Superior, Wis.
Hancock, Mich.
Marquette, Mich.
Sault Ste. Marie, Mich.
Michigan Central Railway & 10th St., West Bay City, Mich.
Eighth & Sears Sts., Saginaw, Mich.
46 Jefferson, Detroit, Mich.
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ATLANTIC REFINING COMPANY, French & 16th Sts., Erie, Pa.
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LAKE SHIPPERS OF STEAM COAL.
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AVOIDS DUST AND NOISE. SAVES COAL.
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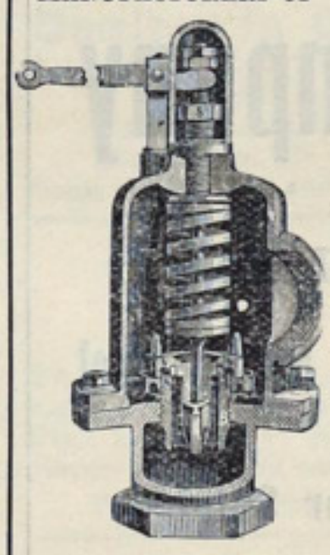

Approved by U. S. Board of Steamboat Inspectors. Adopted by U. S. Navy in all the Steel Cruisers.

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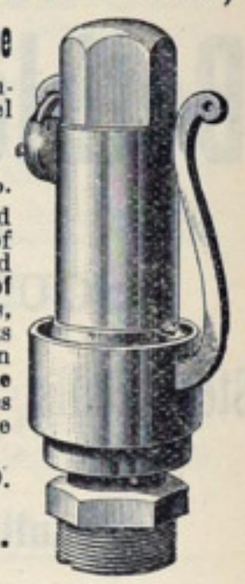

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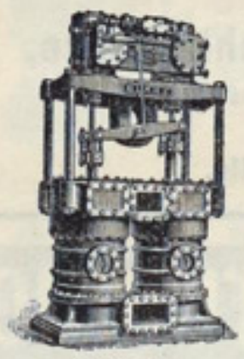

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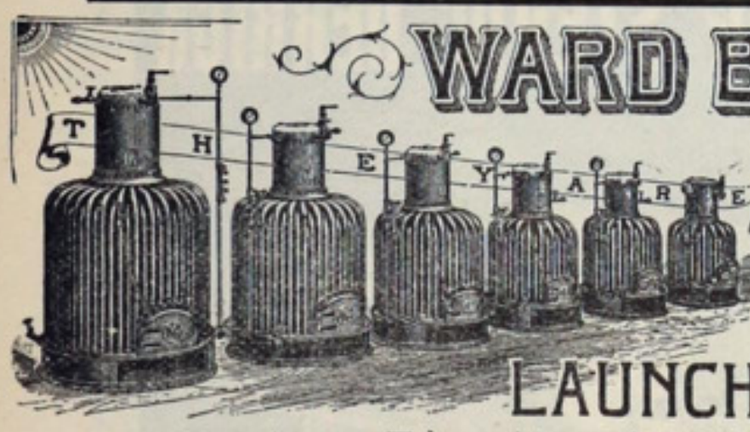


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